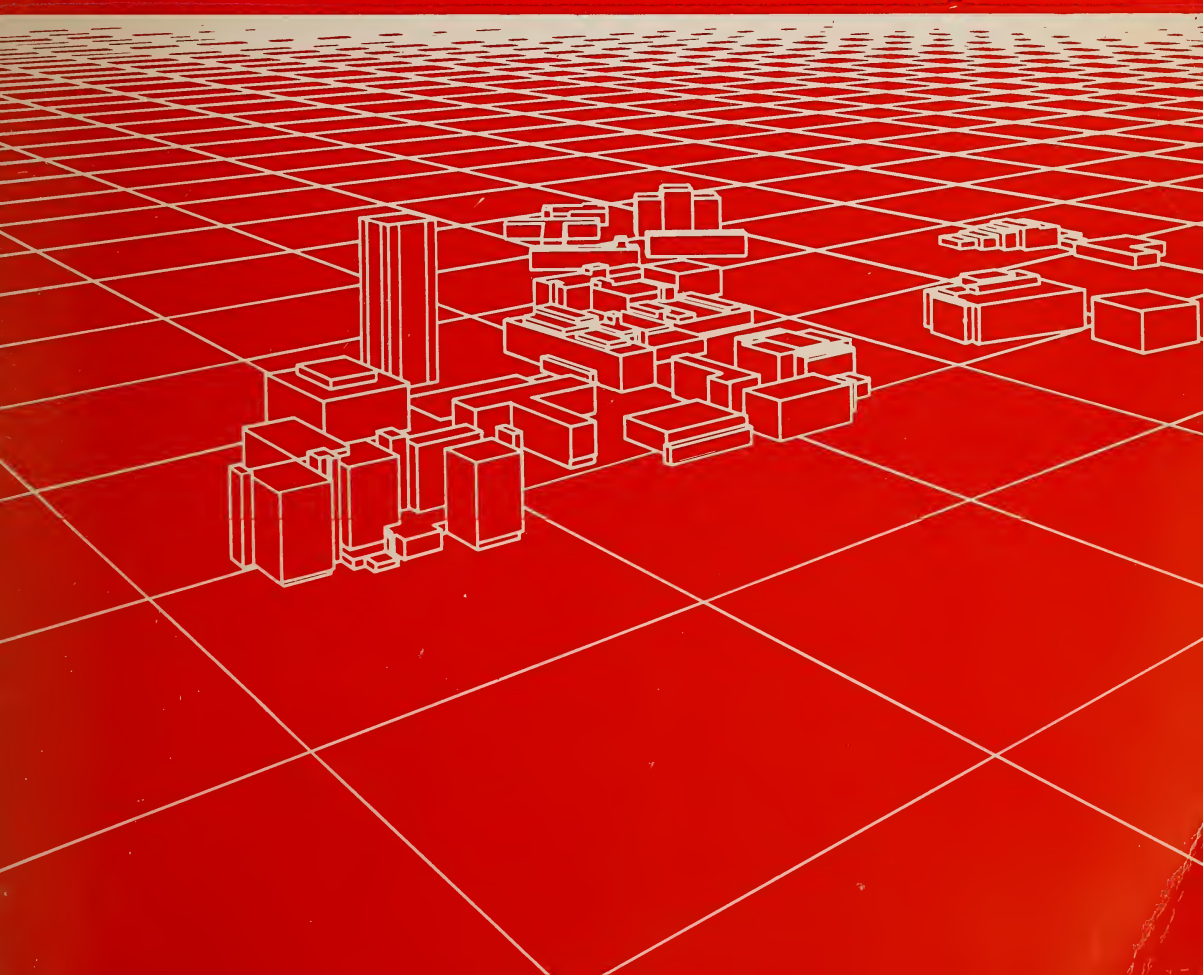
Faculty of Graduate Studies
and Research

Carleton University

Calendar
1983-84



Carleton University

Faculty of Graduate Studies
and Research
1983-84
Calendar

Carleton Fortieth
University Anniversary
Learning in Canada's Capital

Carleton University
Colonel By Drive
Ottawa, Canada K1S 5B6
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Office of the Dean

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Dean of Graduate Studies and Research
S.F. Wise

Associate Dean (Academic)
D.R.F. Taylor

Associate Dean (Research)
J.W. ApSimon

Office Hours
September 1 to April 30
9:00 A.M. to 12:00 noon
1:00 P.M. to 5:00 P.M.

May 1 to August 31
8:30 A.M. to 12:00 noon
1:00 P.M. to 4:30 P.M.

As this calendar is published several months before the opening of the session, the University reserves the right to make whatever changes circumstances may require, including cancellation of particular courses.

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Carleton University

Ottawa, the capital of Canada, is a medium-sized, non-industrial city located at the junction of the Ottawa, Gatineau, and Rideau rivers. Excellent skiing facilities, water recreation areas, and scenic areas are located in the Gatineau Hills a few minutes away from the campus. The National Arts Centre with its own orchestra, the National Gallery of Canada, and other such institutions give the city a well-rounded cultural environment. Entertainment is available in both of Canada's official languages, French and English.

Carleton is a university old enough to have an established reputation, yet young enough to combine its tradition with innovation in ways to meet the diverse needs of modern students.

Founded in 1942 as a non-denominational, private and co-educational college, Carleton initially occupied scattered rented quarters in downtown Ottawa, but by 1946 it had moved to a permanent building in central Ottawa. As the University expanded, it became necessary to plan and develop a new campus located on a large and picturesque site between the Rideau River and the Rideau Canal.

The University awarded its first degrees in 1946, but it did not offer programs of graduate studies until 1954. Carleton's first undergraduate degrees, awarded in 1946, were in journalism and in public administration; its first graduate diploma in 1954 was in public administration. Now, 29 years after the beginnings of its graduate studies, the University also offers graduate instruction leading to the master's degree in some 33 areas and to the doctorate in 15 fields. In 1982-83, Carleton registered 949 full-time graduate students. In addition, 809 students were registered for part-time graduate studies.

Carleton has set as its major goals in graduate studies the promotion of a spirit of independent investigation and the pursuit of scholarly work of consistently high quality. By concentrating on certain fields of studies to the exclusion of others and by electing areas in which it had a comparative advantage, the University has been able to ensure a great measure of success in the pursuit of these goals.

Carleton University has a good base of operation at the graduate level: outstanding scholars, challenging and imaginative programs of studies, students of high quality, libraries, laboratories and other research facilities. Moreover, the location of the University in the capital of Canada also enables graduate students to have access to the vast number of scholars working in government organizations and departments, and to take advantage of research and library facilities associated with these national institutions.

Degree Programs

The following graduate programs are currently offered at Carleton:

Graduate Diploma in Public Administration (D.P.A.)

Master of Arts (M.A.)
In Anthropology, Canadian Studies, Classics, Comparative Literature, Economics, English, French, Geography, German, History, International Affairs, Philosophy, Political Science, Psychology, Public Administration, Religion, Spanish, Sociology, and Soviet and East European Studies

Master of Computer Science (M.C.S.)

Master of Engineering (M.Eng.)
In Aeronautical, Civil, Electrical, Mechanical, and Materials Engineering

Master of Journalism (M.J.)

Master of Science (M.Sc.)
In Biology, Chemistry, Geology, Information and Systems Science, Mathematics, and Physics

Master of Social Work (M.S.W.)

Doctor of Philosophy (Ph.D.)
In Biology, Canadian Literature, Chemistry, Economics, Engineering (Aeronautical, Civil, Electrical, and Mechanical), English, Geology, History, Mathematics, Physics, Political Science, Psychology, and Sociology

Academic Dress

The academic dress of Carleton University is a compromise between the style of hoods outlined in the American Intercollegiate Code and the dress of the ancient foundations of Britain and America.

The master's hood, made of black silk, is of simple or Oxford shape with an open lining of two chevrons (red and black) on a silver field. The border of the hood denotes the degree granted, according to the following colour combinations: arts — white; journalism — white with a black cord sewn slightly in from the lower border; science — golden yellow; social work — cream; engineering — orange. The master's gown is of full style, made of black silk or rayon, with full gathered yoke behind and closed sleeves with an opening at the elbows.

The Doctor of Philosophy hood is also made of silk, but completely opened to show the lining, and provided with a purple border. The doctoral gown has the same style as the master's and is made of royal blue cloth with facings of light blue silk.

The gown of the Honorary Doctorate of Laws, of Science, or of Engineering is a blue robe with bell-shaped sleeves, made of fine royal blue cloth with facings and sleeves in light blue silk. The hood is made of the same material as the gown, has the same lining as that for the degrees granted by examination, and is bordered with purple for the degree of Doctor of Laws, dark red for the degree of Doctor of Science, and orange for the degree of Doctor of Engineering.

The following schedule of dates is anticipated for academic activities and procedures; however, it is subject to final confirmation by the University Senate.

Spring Term and Summer Session 1983

May
Registration for spring term; dates to be announced.

May 16
Spring term classes begin.

May 23
Statutory holiday, University closed.

May 31
Last day for late registration for spring term. Last day for spring term course changes. Students who have not yet deposited the four final copies of their theses in the Graduate Studies and Research Office *must* register.

June
Spring Convocation for the conferring of degrees; date to be announced.

July 1
Statutory holiday, University closed.

July 4
Registration for summer session day division. Summer session day classes begin.

July 8
Last day for late registration for summer session. Last day for summer session course changes.

August 1
Civic holiday, University closed.

August 2
Last day for withdrawal from spring term and summer session courses.

August 12
Last day for spring term and summer session classes.

August 13-16
Spring term and summer session examinations.

Fall Term 1983

June 3
Last day for the receipt of applications for fall term registration from candidates whose documents originate outside Canada. Supporting documents (transcripts, letters of reference, etc.) must be received by June 30. Applications from candidates in this category who intend to register initially for the winter term must be received by October 3, and for the spring term by February 3.

August 12
Last day for receipt of applications for fall term registration from candidates resident in Canada. Supporting documents (transcripts, letters of reference, etc.) must be received by September 2. Applications from candidates resident in Canada who intend to register initially for the winter term must be received by November 4; and for the spring term by April 2.

September 5
Statutory holiday, University closed.

September 6-9
Registration of graduate students for the fall and winter terms.

September 12
Classes begin in all courses.

September 15
Last day for submission to the thesis supervisor of four examination copies of master's and Ph.D. theses for Fall Convocation. Last day for receiving applications for degrees from potential graduates for Fall Convocation.

September 30
Last day for late registration for fall term. Last day for course changes for full courses and fall term half-courses. Students who have not yet deposited the four final copies of their theses in the Graduate Studies and Research Office *must* register.

October 10
Statutory holiday, University closed.

October 14
Last day for submission to the Graduate Studies and Research Office of four final copies of master's and Ph.D. theses for Fall Convocation.

November
Fall Convocation for the conferring of degrees; date to be announced.

November 1
Last day for withdrawal from fall term half-courses.

December 2
Last day for fall term classes.

December 5-17
Mid-year examinations, including half-course finals, may be scheduled as announced.

December 15
Last day for receiving applications for degrees from potential graduates for Winter Graduation.

Winter Term 1984

January
Registration for winter term; dates to be announced.

January 3
Winter term classes begin.

January 31
Last day for course changes for winter term half-courses. Last day for late registration for winter term. Students who have not yet deposited the four final copies of their theses in the Graduate Studies and Research Office *must* register.

February 20-24
Study period.

March 1
Last day for withdrawal from full courses and winter term half-courses.

March 2
Last day for receipt of applications for admission from candidates who wish to be considered for the initial award (April 1) of financial assistance (including Carleton fellowships, scholarships, and departmental assistantships) administered by Carleton University. Supporting documents (transcripts, letters of reference, etc.) must be received by March 13. Candidates whose applications are received after the March 2 deadline date may be eligible for the award of a fellowship, scholarship, or assistantship by reversion. Awards by reversion are normally considered on or about May 15, August 15, and October 1.

March 15
Last day for receiving applications for degrees from potential graduates for Spring Convocation.

April 2
Last day for submission to the thesis supervisor of four examination copies of master's and Ph.D. theses for Spring Convocation.

April 6
Last day for winter term classes.

April 11-28
Final examinations may be scheduled as announced.

April 20
Statutory holiday, University closed.

April 30
Last day for submission to the Graduate Studies Office of four final copies of master's and Ph.D. theses for 1984 Spring Convocation.

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Admission Requirements

Graduates of recognized universities will be considered for admission to the Faculty of Graduate Studies and Research. The University's general policy on admission is outlined below, but all applicants should refer to the departmental statements in this calendar for details concerning the specific or additional requirements of each department, institute, or school.

A combination of factors is taken into consideration in assessing the eligibility of a candidate for admission into one of the graduate programs:

- The performance of the candidate and the assessment provided by his/her referees as a measure of the likelihood that the candidate can successfully complete the course of studies and research defined by the Senate of the University for the given degree
- The capacity of the graduate department, institute, or school to provide a program of studies and research which would meet the expectations of the candidate as defined in his/her statement of academic interests and ambitions
- The availability of a faculty member competent to supervise the academic program of studies and research of the candidate at the time.

Qualifying-Year Program

Applicants who do not qualify for direct admission to the master's program may be admitted to a qualifying-year program. Applicants who lack an honours degree, but have a pass degree with second-class standing (at least B overall) will normally be admitted to a qualifying-year program.

If successful in this qualifying year, they may eventually proceed to the master's program. However, admission to the qualifying-year program does not imply automatic admission to the master's program. At the end of the qualifying-year program, the department will determine the student's eligibility to enter the master's program, and the student will be informed of this decision by the dean of the Faculty of Graduate Studies and Research.

Applicants for a master's degree who have a program requirement of 7½ full courses or more (with the exception of Social Administration) will register initially in the qualifying-year program.

Master's Program

For admission to the master's program, applicants must hold an honours bachelor's degree, or the equivalent, with at least high second-class standing (normally B+ or better in honours subject; B- or better overall). The applicant must also be recommended by the department in which he/she plans to undertake his/her studies.

Applicants for a master's degree who have a program requirement of seven full courses or less will register directly in the master's program.

Doctoral Program

For admission to the Ph.D. program, applicants must ordinarily hold a master's degree from a recognized university, with at least high second-class standing (normally B+ or better in honours subject; B- or better overall).

Applicants should note that of the bachelor's, master's, and Ph.D. degrees, only two may ordinarily be taken at Carleton University.

Application for Admission

Applications for admission to the Faculty of Graduate Studies and Research should be made on prescribed forms, available from the major department or the Graduate Studies and Research Office, and they should be submitted directly to the department. To cover administrative costs, a non-refundable charge of $10 is required with each application.

Deadlines

Candidates whose documents originate outside Canada must apply by June 1. All other applications must be received no later than August 12.

Applicants wishing to be considered for financial assistance from Carleton University are reminded that they must submit their completed applications for admission by March 11.

Transcripts

Two detailed *official* transcripts of the applicant's entire university record must be sent to the chairman of the department concerned.

Letters of Reference

All applications must be supported by letters of recommendation from at least two faculty members with whom the candidate has studied, who are in a position to assess his/her potential for graduate studies and research. References from non-academic supervisors are not ordinarily acceptable, except in certain cases, such as that of an applicant working in a research laboratory environment. All letters of reference are to be sent by the referees directly to the chairman of the department.

Proficiency in English

Proficiency in English usage is considered necessary to pursue graduate studies at Carleton University. All applicants whose native tongue is not English must be tested for proficiency in the English language, and obtain a minimum score of 550. Tests are administered by TOEFL, Box 899, Princeton, N.J. 08540, U.S.A.

Admissions Procedure

All applications for admission will initially be examined and evaluated by the department, institute, or school in which the applicant wishes to study. All supporting documents (transcripts, letters of reference, etc.) must be received before any application can receive formal consideration.

Completed applications of those students whom the department wishes to recommend for admission will be forwarded to the dean of the Faculty of Graduate Studies and Research for consideration. The dean's office will officially notify each applicant whose admission is approved.

The Statement of Standing on Admission issued to each newly-admitted student is valid only for the 12-month period stipulated on the form. If the applicant fails to register within this period of time, his/her admission and registration eligibility will lapse automatically. He/she may re-apply for admission.

Program Requirements

A description of each program offered under the auspices of the Faculty of Graduate Studies and Research is presented in the departmental program descriptions and details of courses section of this calendar. Prospective applicants should note particularly the admission requirements, the fields in which advanced study and research may be undertaken, and the program requirements of each department, in addition to the general regulations of the Faculty of Graduate Studies and Research, which are spelled out in this section.

Qualifying-Year Program

Students in the qualifying year will ordinarily register in five full courses (or the equivalent) at the senior undergraduate level. Of these five, no more than one course at the 200 level and no more than two at the 500 level may be taken.

Master's Program

The normal requirement for the master's degree is five full courses, or the equivalent, of which at least four (including the thesis where applicable) must be at the 500 level. With departmental approval, the remaining one course may be selected from those offered at the senior undergraduate level, that is, at the 400 level.

Doctoral Program

The period of formal study and research required in the Ph.D. program will normally be at least two years of full-time study (or the equivalent) beyond the master's level.

The thesis will ordinarily carry a weight of about half of the total requirement of 10 full courses or the equivalent.

Ordinarily, all courses taken for credit towards the Ph.D. degree must be at the 500 or 600 level.

Transfer of Credit on Admission

Graduate courses completed at another institution may be accepted in partial fulfilment of Carleton's degree requirements.

Credit for such work will be determined in each case by the executive committee of the Faculty of Graduate Studies and Research, on the recommendation of the department concerned. Master's

candidates are allowed a maximum of two transferred full-course credits. In addition, if a master's candidate is granted transfer credit for two full courses, his/her remaining three courses at Carleton must be at the 500 level.

Doctoral candidates may be given up to one year's credit for work completed at other universities, but must normally register for a minimum of one year of full-time studies thereafter at Carleton, and fulfil the thesis and comprehensive examination requirements. Students admitted with transfer of credits in a Ph.D. program may be required to pass a qualifying examination upon entry.

A candidate who has completed courses as a special student is not normally permitted to transfer such courses for degree credit in the Faculty of Graduate Studies and Research.

Transfer of Credit After Admission

A student formally admitted, and eligible to register in a graduate program, is not permitted to register at Carleton University at the same time in any other graduate program or as an undergraduate or special student. Should he/she do so, credits may not be transferred.

Similarly, if a student, formally admitted to a graduate program at Carleton (but not yet registered), wishes to enrol in courses at another university, credit will be granted only if written permission is received from the dean of graduate studies and research. Such permission must be received in advance of registration for the course work. *In no case will such transfer alter the maximum number of allowable transferred credits noted above.*

Language Requirements

Some graduate programs require a reading knowledge of one or more languages other than English. Language requirements will be prescribed by departments according to their regulations and the needs of their students.

Registration and Course Selection

The Faculty of Graduate Studies and Research divides the calendar year into three terms, and the academic year (September-May) into two terms; each term comprises about 13 weeks of lectures or seminars. The first term of the academic year is designated as the *fall term* (registration period at the beginning of September); the second term of the academic year is designated as the *winter term* (registration period early in January), and the third term of the calendar year is designated as the *spring term* (registration period in late May). Graduate and senior undergraduate courses are also offered in the *summer session*, (registration period early in July) which comprises approximately six weeks of lectures or seminars. The precise dates of registration for the fall, winter, and spring terms, and for the summer session are specified in the academic schedule of this calendar.

All students enrolling at Carleton are required to register in their programs at designated times prior to the beginning of classes. They will initiate their registration procedures in their major department, from whom information concerning all phases of registration will be available.

Graduate students must have *written approval* from their departmental supervisor of graduate studies for initial course/program registration, and for any subsequent course changes. This approval is also required for any undergraduate student who wishes to register in a graduate-level course.

Credit will be granted only for those courses and research activities for which the candidate is formally registered. An unregistered student is not entitled to attend lectures, tutorials, or seminars, and is not entitled to thesis supervision, examination privileges, or access to research facilities. A student will receive no credit for any work completed during a term in which he/she was not properly registered.

Course Selection

A student proceeding to a graduate degree or diploma must arrange his/her program according to the regulations of the Faculty of Graduate Studies and Research and the major department.

The course and thesis requirements of each graduate program are organized or defined in units of full-course credits. A full-course credit typically comprises three hours of lectures or seminars a week for two terms, or the equivalent. A half-course credit typically comprises three hours of lectures or seminars a week for one term, or the equivalent.

Evaluation

To gain standing in a course, a student must meet the course requirements for attendance, term work, and examinations.

Instructors will inform their classes by distributing written notices before the last day for late registration of the elements that will contribute to the final grade and their weighting, including attendance, class participation, essays, tests, laboratories or studio-workshops, or other course-related work assignments, and final examinations.

Supplemental or other grade-raising examinations are not permitted for students registered in the Faculty of Graduate Studies and Research.

Tutorials

These are arranged to allow students to take full advantage of all the resources of the University, even in areas or fields of a very highly specialized nature. Such arrangements are subject to the approval of the supervisor of graduate studies, who will arrange that a document spelling out the details of the topic, reading list, etc., is submitted to the Faculty of Graduate Studies and Research before the last day for course changes in the term concerned.

Audit Courses

Graduate students may register to audit *one full course per program*. Full-time students will not be charged an additional fee; others must pay the prevailing fee for part-time students.

Course Numbering System

Each course is identified by a seven-symbol code. The first two digits indicate the department, school, or committee under whose auspices the course is offered; the three digits following the decimal point identify the specific course; the letter which follows the course number designates the term in which the course is offered: for example, F: fall term, W: winter term, S: spring term, and T: two terms (fall and winter, or winter and spring, etc.). The number which follows the letter indicates the credit weight of the course: 1 denotes one half-course credit, 2 denotes one full-course credit, etc.

Status

A full-time graduate student will normally register in a minimum of three half-courses (or the equivalent) per term.

Part-time students are permitted to enrol in a maximum of two half-courses per term.

All students are reminded that status is established only by formal registration in the appropriate courses for each term of activity in the calendar year.

Whether a student registers on a full- or part-time basis in the thesis, research essay, or independent research project is determined by the amount of time devoted to graduate studies and research, and the demands on university personnel, resources, and facilities.

Definition of Full-time Study

In addition to the *course load* requirements described above, the following criteria for full-time status have been established by the Ontario Ministry of Colleges and Universities:

- Students must identify themselves as full-time students; that is, they must so register during each term of activity.
- Students must be geographically available and visit the campus regularly; they may not be absent from campus without permission for a period exceeding four weeks in any term. Students wishing to undertake full-time studies off campus must secure, in advance, the written permission of the departmental chairman and the dean of graduate studies and research. (See Off-Campus Research)
- A full-time graduate student may not be regularly employed on work not directly related to his/her program for more than an average of 10 hours per week during any period of full-time registration.

Off-Campus Research

In the interest of enriching their learning experience, graduate students may arrange to undertake full-time studies or research at another institution, or in the field. It should be understood that such activity would apply to only a part of the total program, and that the off-campus period would not normally exceed 12 months.

Requests for permission to undertake full-time off-campus study or research must be submitted, well in advance, to the dean of graduate studies

and research, through the department concerned. Such requests should include the following information:

- A detailed statement of the research proposal or program of studies, and the specific arrangements that are proposed for the supervision and direction of the work
- An explanation of the reasons why the work cannot be satisfactorily undertaken while on campus at Carleton
- A description of the studies and/or research facilities that are available at the proposed off-campus location
- A written statement from a responsible official (for example, the on-site supervisor or director) of the outside institution, confirming that the proposed arrangements are satisfactory, and that the candidate will be able to undertake research or studies
- A time schedule for the proposed studies or research work
- A statement of the candidate's expected sources of financial support.

Inter-University Co-operation in Graduate Instruction

Under certain circumstances, it is permissible for a student admitted to a graduate degree program, and registered at one Ontario university, to follow an approved credit course at another university. All interested students should consult the chairman of their department, prior to registration, in order to obtain further information on procedures and conditions of eligibility.

University of Ottawa

Through a reciprocal agreement, a graduate student registered at Carleton University may be permitted to follow *up to two full courses* at the University of Ottawa. Moreover, there are reciprocal arrangements worked out among departments, institutes, and schools at both universities to involve students, when it is desirable, in parts of the program of research and studies at the other institution. All interested students should consult the chairman of their department, institute, or school, prior to registration, in order to obtain further information on particular departmental conditions of eligibility and procedures.

Continuous Registration

Any candidate who remains unregistered in his/her degree program for three terms (12 months) will lose his/her graduate status.

Continuous Registration in Thesis, Research Essay, or Independent Research Project

Any candidate (full-time or part-time), after initial registration in a thesis, research essay, or independent research project, must maintain this registration in all successive terms (including the term in which the student is examined), until his/her thesis, research essay, or independent research project is completed. Completion means modifications, any retyping involved, etc.

In the case of a thesis, registration must be maintained until six final copies are deposited in the Graduate Studies and Research Office. Should the final copies not be deposited in the Graduate Studies and Research Office by the last day for late registration in a given term, the student will be required to register for that term.

Students should note that faculty approval to register in the thesis, etc., is given on the understanding that the student will be in regular contact with his/her supervisor, and that thesis research will be actively pursued in each term of registration.

Registration by mail is acceptable for part-time students in theses, etc., provided that the prescribed form is completed and returned (through the department concerned) together with fee payment (cheque or money order) before the last date for course changes in each term.

Exemption from Registration

Students who have valid reasons for not registering for a term may apply for permission to remain unregistered by:

- Writing to the dean of graduate studies and research stating the reasons for seeking exemption from registration
- Requesting a statement from the departmental supervisor of graduate studies (and from their thesis supervisor, if there is one) in support of their request, confirming that they will not be on campus for the term, will not use any University facilities (that is, library, laboratories, computer centre, etc.), or receive any supervision, including supervision through correspondence.

It is understood that such an exemption from registration will be granted only in exceptional cases (for example, medical or other special reasons).

Exemptions are normally granted for one term, but in extraordinary circumstances an exemption may be granted for a longer period.

Off-Campus Registration

Students who have been permitted to study off campus, while registered full-time at Carleton, may register by mail. Registration forms may be obtained from the Graduate Studies and Research Office upon request.

Course Changes

A course change is the addition or deletion of one or more individual courses by a registered graduate student. This is the only acceptable procedure for revising or correcting a graduate student's registration. All course changes must be made on prescribed course change forms, which are available at the departmental offices or at the Graduate Studies and Research Office.

The deadline dates for course changes are stipulated in the academic schedule of this calendar.

Withdrawal

A graduate student wishing to terminate his/her registration in a graduate program (that is, drop all courses) must complete the prescribed withdrawal form (or apply in writing to the dean of graduate studies and research) and return his/her identity card.

When a student officially withdraws, with the approval of the dean of graduate studies and research, a refund of fees will be calculated on a pro rata basis as of the date of receipt of the withdrawal form (or letter) and the identity card. Credit for fees or refunds will depend on the date of withdrawal and the amount of fees paid.

Graduate students are cautioned that there is no procedure at Carleton University for direct "mid-term" transfer from one graduate program to another. Similarly, there can be no direct transfer to or from undergraduate or special student status. Any candidate who elects to change programs after registration (*before* the last day of late registration) will be required to withdraw from the first program and then register in the second. The pro rata refund of fees calculated as a result of withdrawal from the first program can be applied against the new fee assessment for the second program.

A registered candidate who completes his/her degree or diploma requirements prior to the last day for withdrawal in any term (as specified in the academic schedule) is required to withdraw formally if he/she anticipates any refund of fees. A candidate whose degree program has been completed is not eligible for further registration in the Faculty of Graduate Studies and Research (unless he/she has been admitted to some other graduate program).

Examinations

Final examinations in courses will be held at the times indicated in the academic schedule. Graduate students must obtain grades that meet the standards outlined in the academic standing section of this calendar, and that satisfy the specific requirements of the department concerned.

A graduate student who is unable to write a final examination because of illness or other circumstances beyond his/her control, or whose performance on the examination has been impaired by such circumstances, may apply to write a special or deferred final examination. Such an application will be considered only if it is submitted in writing to the dean of graduate studies and research within two weeks of the examination.

If the student has been seen at the University Health Services, the dean's office will confirm the illness by contacting the treating physician. If the student has consulted a physician outside the University, he/she will be required to submit a statement (from the physician) confirming the illness.

In cases other than illness, appropriate documents will be required.

Supplemental or other grade-raising examinations are not permitted for students registered in the Faculty of Graduate Studies and Research. Graduate students may, however, with the permission of their department, repeat a course at the time of next regular offering to obtain higher standing.

Master's Examinations

In addition to any examination which may be required in individual courses, a master's candidate who is writing a thesis will be expected to undertake either an oral defence of the thesis or a comprehensive examination in his field of specialization, or both. The thesis must be submitted, in examinable form, at least two weeks in advance of the thesis examination. When the degree is taken by course work, a comprehensive examination may be required. It is important to note that individual departments may have additional or particular requirements.

Doctoral Examinations

Doctoral candidates may be asked to pass a qualifying examination at the beginning of their residence at Carleton.

A comprehensive examination, covering prescribed fields, will normally be undertaken one year prior to the thesis presentation. This examination (oral or written, or both) may include any material considered fundamental to a proper comprehension of the field of study.

After the thesis has been received and accepted for examination, a final oral examination on the subject of the thesis and related fields will be held. Such thesis examinations will be scheduled upon receipt of theses, which must be submitted at least four weeks in advance of the date of the examination.

Comprehensive and Thesis Examinations

The date, place, and time of comprehensive or thesis examinations will be announced at least two weeks in advance. An examining board will be appointed according to the guidelines laid down by the Faculty of Graduate Studies and Research.

If the comprehensive examination is graded *Unsatisfactory,* the department may permit the candidate to repeat the examination. If the comprehensive examination is graded unsatisfactory for a second time, a request by the department that the candidate be allowed to continue in the program would require the approval of the executive committee of the Faculty of Graduate Studies and Research.

The comprehensive and thesis examination processes must be conducted according to the principles and practices prescribed by the Faculty of Graduate Studies and Research. (See Registration and Course Selection)

Grading System

Carleton University employs the 12-point system of letter grades to represent standing in graduate lecture courses, directed studies, seminars, tutorials, and some research essays and theses. The letter grades used, and the grade point equivalents, are as follows:

A+	12	B+	9
A	11	B	8
A–	10	B–	7
C+	6	D+	3
C	5	D	2
C–	4	D–	1

Under certain defined circumstances, notations are used instead of letter grades to represent standing. The only notations permissible in the Faculty of Graduate Studies and Research are the following:

- A notation of *Satisfactory* or *Unsatisfactory* may be assigned, subject to the approval of the Faculty of Graduate Studies and Research, in certain very special courses involving practicum, field work, or other complex activities not easily adaptable to the 12-point system of grading.
- Comprehensive examinations are graded *Pass With Distinction, Satisfactory,* or *Unsatisfactory.*
- The master's thesis is graded *Pass With Distinction, Satisfactory,* or *Unsatisfactory,* or it may be assigned a letter grade. The oral defence is graded *Satisfactory* or *Unsatisfactory.*
- The Ph. D. thesis and its oral defence are each graded *Satisfactory* or *Unsatisfactory.*
- A notation of *Incomplete* may, subject to the approval of the chairman of the department, be assigned to a course in which the student has been granted the privilege of submitting an assignment after the final deadline date. This notation of *Incomplete* will be permissible only in exceptional cases, (for example, medical or other special rea-

sons) and must be replaced with a letter grade within 40 days of the end of classes. If the notation of *Incomplete* is not changed to a letter grade (through the regular change-of-grade procedures) within 40 days of the end of classes, the notation will remain as a permanent entry for that registration in the course. However, the student may register to repeat the course in order to obtain letter grade credit.

- A notation of *Absent* will be assigned to any course in which the student failed to attend the final examination. If the student explains his/her absence (in writing) to the dean of graduate studies and research within 14 days of that examination, he/she may be granted the privilege of undertaking a special or deferred examination. The notation of *Absent* will also be assigned where a student has terminated a course without formally withdrawing from the course prior to the end of classes; this notation is deemed to be the equivalent of a failure.
- If a thesis, research essay, or independent research project is not completed by the end of the period of registration, a notation of *In Progress* will be recorded. This notation must be replaced by an appropriate final notation or grade (as specified above) after the thesis, research essay, or independent research project has been examined. In cases where a student has registered in a research essay or a thesis, without completing it, and later undertakes course work to complete the degree program — or loses graduate student status in his/her program — the notation *In Progress* will be changed to *Incomplete*.

Academic Standing

Qualifying-Year Program

The general regulations governing academic standing in the qualifying year conform to those of the master's program.

Master's Program

A grade of B– or better must normally be obtained in each course credited towards the master's degree. A candidate may, with the recommendation of his/her department, be allowed a grade of C+ or C (but not C–) in one full course or each of two half-courses. Some departments do not permit the C+/C option; students should check carefully to see if the department in question has a B- minimum rule.

Full-time master's candidates who fail to achieve a weighted grade point average of 7.0 after two terms of study, or to maintain it subsequently, will be required to withdraw from the program. In the event of special or extenuating circumstances, the student may apply to the executive committee of the Faculty of Graduate Studies and Research for permission to continue in the program.

A part-time master's student who fails to achieve or maintain a weighted grade point average of 7.0 after completing two full courses (or equivalent) will be required to withdraw from the program.

In addition to the above requirements, departments will undertake a periodic evaluation of a student's progress in his or her overall program of studies and research to determine whether that progress is satisfactory. In the event that progress is deemed unsatisfactory, the student may be asked to withdraw.

Doctoral Program

Doctoral students must normally obtain a grade of B– or better in each course credited towards the degree.

In addition to the above requirements, departments will undertake a periodic evaluation of a student's progress in his or her overall program of studies and research to determine whether that progress is satisfactory. In the event that progress is deemed unsatisfactory, the student may be asked to withdraw.

Thesis Requirements

General Remarks

The thesis is a major requirement of most programs and, in conjunction with the research for it, makes up at least one-half of the time normally required for the program. The thesis must be expressed in a satisfactory literary form, consistent with the discipline concerned, and must display a scholarly approach to the subject and thorough

knowledge of it. A critical review of previous work related to the subject should usually be given.

A candidate will not be permitted to submit a thesis for which he or she has previously received a degree; however, with the permission of the dean of the Faculty of Graduate Studies and Research, he or she may incorporate into the thesis material that was included in a previous thesis.

Master's Thesis

The master's thesis should embody the results of successful scholarly research in a specialized area. It should exhibit the candidate's knowledge of recognized techniques of investigation and critical evaluation, and be presented in an organized and systematic way.

Candidates are ordinarily required to undertake an oral examination on the thesis. Notice of this examination will be given at least two weeks in advance by the chairman of the department.

The master's thesis will be examined by a board consisting of at least three members, including the thesis supervisor, the chairman of the department concerned, and an examiner from a department other than that of the candidate.

The constitution of the examining board will be announced by the chairman of the department concerned; both it and the thesis examination process are defined by guidelines, principles, and practices prescribed by the Faculty of Graduate Studies and Research.

Thesis weight (one to two full courses) must be identified at the time of admission. A change in the thesis weight at a later date would require the approval of the executive committee of the Faculty of Graduate Studies and Research.

Faculty regulations governing research essays and independent research projects are normally the same as those for a master's thesis, and subject to the guidelines, principles, and practices prescribed by the Faculty of Graduate Studies and Research.

Doctoral Thesis

The doctoral dissertation must report, in an organized and scholarly fashion, the results of original research. The thesis must be a contribution to knowledge, and must demonstrate the candidate's ability to undertake sustained research and to present his/her findings in an appropriate manner.

The dissertation must be defended successfully at an oral examination. Notice of this examination will be given at least two weeks in advance by the dean of the Faculty of Graduate Studies and Research.

The doctoral dissertation will be examined by a board consisting of at least five members, including the thesis supervisor, the chairman of the department concerned, an examiner from a department other than that of the candidate, the members of the candidate's advisory committee, the dean of the Faculty of Graduate Studies and Research or his delegate, and an external examiner who is a recognized authority on the subject of the thesis.

The constitution of the examining board will be announced by the dean of the Faculty of Graduate Studies and Research; both it and the thesis examination process are defined by guidelines, principles, and practices prescribed by the Faculty of Graduate Studies and Research.

Thesis weight (ordinarily about half of the total Ph.D. requirement of 10 full courses) must be identified at the time of admission. If the thesis weight falls within a range of credit weights, it should be assigned at the time of admission a weight corresponding to the lower bounds of that range. A change in the thesis weight at a later date would require the approval of the executive committee of the Faculty of Graduate Studies and Research.

The work of each Ph.D. candidate will be assisted by an advisory committee of faculty members, who will aid him/her in his/her preparation for the final comprehensive examination, and assist in the evaluation of the thesis and oral examinations.

Deadlines

A master's student expecting to graduate at the Spring Convocation must submit his/her thesis or dissertation to his/her supervisor, in examinable form, by *April 1.* A master's student expecting to graduate at the Fall Convocation must submit his/her thesis by *September 15*.

A Ph.D. student expecting to graduate at the Spring Convocation must submit his/her thesis or dissertation to his/her supervisor, in exam-

inable form, by *April 1.* A Ph.D. student expecting to graduate at the Fall Convocation must submit his/her thesis by *September 15.*

Specifications

- The candidate must submit *six* typewritten copies (original and five carbons or acceptable duplicated copies, on bond paper) and must comply with special departmental requirements governing the form of the thesis, including methods of bibliographical entry, and the use of diagrams and tables.
- Each thesis or dissertation must be accompanied by a suitable abstract. The abstract of a master's thesis should not exceed 150 words, while the abstract of a doctoral thesis may be up to 350 words in length.
- Regulations regarding style, pagination, certification, acceptance, grade and size of paper, as well as abstracts, reproduction, microfilming, binding, and the constitution of the examining board will be prescribed by individual departments.

The candidate is expected to notify his/her supervisor and the chairman of the department (at least two weeks in advance) of the date on which he/she intends to submit *six* copies of his/her completed thesis. The thesis examination and defence will then be scheduled and the date will be announced at least two weeks in advance.

- The four unbound copies of the approved thesis submitted to the faculty for binding should be the original and three others, and they must be presented in order of pagination in separate envelopes. The third copy is given to the department; the fourth copy is for the candidate.

Licence to the University and to the National Library of Canada

In the interest of facilitating research by members of the Carleton community and by interested outsiders, and in consideration of his/her having been accepted as a graduate student at Carleton, the student author of a thesis or dissertation submitted in partial fulfilment of the requirements for an advanced degree, shall grant to the University and to the National Library of Canada a licence to make single copies or microfilms (solely for the purpose of private study and research, in response to written requests from individuals, libraries, universities, or similar institutions).

It is understood that the student author retains other publication rights, and that neither the thesis, nor the dissertation, nor extensive extracts from them, may be printed or otherwise reproduced without the author's written permission.

Withholding of Thesis Deposition

If, at the time of submitting his/her thesis, the student elects to protect any rights to immediate commercial publication, or to obtain a patent which may arise from his/her research, or to keep his/her thesis out of circulation for other reasons, he/she may apply in writing to the dean of graduate studies and research requesting that the thesis be withheld from deposit in the library:

- For an initial period of three months without reason
- For each additional period of six months, with reason (total period of restriction not to exceed two years).

The student must submit any request for extension of the restriction one month prior to the termination of the previous period. The student and his/her supervisor will be required to justify the extension of the restriction. Subsequent requests must follow the same procedure.

Time Limits

There are maximum time limits for the completion of programs. Candidates may also be subject to time constraints prescribed by individual departments to ensure orderly progress through the stages of their programs.

Master's Programs

Full-time

Full-time master's candidates must complete their degree requirements within six terms of registered full-time study. Students admitted to a 10-course master's program (that is, in the School of Public Administration and the School of Social Work) must complete their degree requirements within nine terms of registered full-time study.

Part-time
A part-time master's candidate must complete his/her degree requirements within an elapsed period of six calendar years after the date of initial registration. Students admitted to a 10-course master's program (that is, in the School of Public Administration and the School of Social Work) must complete their degree requirements within an elapsed period of eight calendar years after the date of initial registration.

Combined Full-time and Part-time
A master's candidate who elects to complete his/her program by a combination of full-time and part-time study is governed by the following elapsed-time limitation: five calendar years if the candidate is registered as a full-time student for two or three terms and part-time for the balance; four calendar years if the candidate is registered four or five terms as a full-time student and part-time for the balance.

Doctoral Programs

Full-time
A full-time Ph.D. candidate who is admitted on the basis of a master's degree (that is, with a program of 10 full courses or the equivalent) must complete the Ph.D. degree requirements within an elapsed period of six calendar years after the date of initial Ph.D. registration.

Part-time
A Ph.D. candidate who undertakes the program by a combination of full-time and part-time study must complete the degree requirements within an elapsed period of eight calendar years beyond the master's level.

Extension of Time Limit

In exceptional cases, an extension of time (one or two terms) may be granted to a candidate whose recent progress, as judged by the department, has been otherwise satisfactory. Requests for extension of time should be directed to the dean of graduate studies and research through the department concerned.

Appeals

Academic Appeals

Within two weeks of the release of grades or the announcement of comprehensive examination results or thesis results, a graduate student may request, through the dean of the Faculty of Graduate Studies and Research, that one or more of his/her grades or results be reviewed. The charge for such a review is $25, which is refundable if the grade is raised.

A graduate student also has the right to appeal decisions made concerning his/her graduate status or any other ruling related to his/her program of studies.

All such appeals are to be made in writing, with an explanation of the pertinent circumstances, to the dean of the Faculty of Graduate Studies and Research. The appeal, and the reply of the department concerned, will be subsequently considered by the executive committee of the Faculty of Graduate Studies and Research.

Graduation

On the recommendation of the Faculty of Graduate Studies and Research, and with the approval of the Senate of the University, degrees are conferred by the chancellor in the spring and fall of each year. In addition, candidates may have their degrees certified in February each year; they must apply by *December 15*.

Students expecting to graduate at the Spring Convocation must apply for graduation in the Graduate Studies and Research Office by *March 15*. Those expecting to graduate at the Fall Convocation must apply by *September 15*.

General Information

Hours of Operation

Bookstore

Labour Day to May
Monday to Thursday 9:00 A.M.—9:00 P.M.
Friday 9:00 A.M.—4:30 P.M.

There will be no refunds or exchanges without the Bookstore cash register receipt. Refer to the Bookstore refund/exchange policy, located in the store, for further details.

Business Office

Monday to Friday 9:00 A.M.—4:00 P.M.

Evening Service
Labour Day to April 30
Monday to Thursday 5:00 P.M.—7:00 P.M.

May to Labour Day
Monday *and* Thursday 5:00 P.M.—7:00 P.M.

Library

Summer Session
Monday to Thursday 8:30 A.M.—11:00 P.M.
Friday 8:30 A.M.—6:00 P.M.
Saturday 10:00 A.M.—5:00 P.M.
(5:00 P.M.—10:00 P.M.)*
Sunday 1:00 P.M.—8:00 P.M.
(8:00 P.M.—10:00 P.M.)*
*Hours are extended after summer day division begins in July.

Winter Session
Monday to Thursday 8:30 A.M.—11:00 P.M.
Friday 8:30 A.M.—6:00 P.M.*
Saturday 10:00 A.M.—10:00 P.M.*
Sunday 12:00 noon—10:00 P.M.*
*Week-end hours are extended to 11:00 P.M. during periods of heavy use.

When classes are not in session hours vary and are posted at the entrance.

Alumni Association

The Alumni Association encompasses the more than 34,000 graduates of Carleton University. Membership is automatic after receiving a degree, diploma, or certificate from the University, or by application after completing five full courses.

The objectives of the association are:

- to contribute to the development of the University, academically and otherwise, and to the effectiveness with which it fulfils its role in society
- to establish and maintain mutually beneficial relations and communications between the University and its alumni, and among the alumni members themselves
- to foster an understanding of the function of the association among the students of the University and the University community generally
- to be of service and mutual benefit to the association's membership and the University
- to undertake such other projects which in the opinion of the Alumni Council and the Board of Governors may be conveniently carried out under these terms of reference.

The Alumni Association is governed by an elected, 15-member Alumni Council. Information about the activities of the association and the council is available through the Alumni Relations Office at 231-3833.

Athletics and Recreation

The athletics and physical recreation program at Carleton, which plays an important role in maintaining and enhancing the University spirit, is determined by the policies established by the Athletic Board, a committee consisting of students, faculty members and administrators.

At the intercollegiate level, Carleton is a member of both the Ontario University Athletic Association (for men) and the Ontario Women's Intercollegiate Athletic Association. Varsity programs for men include basketball, football, cross-country skiing, soccer, waterpolo, and fencing. The women's teams participate in basketball, volleyball, cross-country skiing, synchronized swimming, and

fencing. Graduate students are eligible for intercollegiate athletics, subject to league regulations.

The intramural program includes touch football, cross-country running, basketball, broomball, badminton, swimming, curling, and hockey. Some of these sports are co-educational, although most are played separately by men and women.

Carleton's athletic facilities currently include football and soccer fields, an outdoor hockey and skating rink, five all-weather tennis courts, a 50-metre swimming pool, fitness centre, and a gymnasium complex, which includes such facilities as squash courts, combatives room, gymnastics and multipurpose room, and a gymnasium. These facilities are available for use by Carleton students for organized and recreational sports activities.

Chaplaincy

For the past 20 years there has existed at Carleton a chaplaincy service, part of whose function has been to share with others experiences, insights, friendships, and faith, but which has also been involved in study and discussion groups, community projects, development education, marriage preparation, and religious services. The chaplaincy service also has connections with many organizations and resources on campus, as well as with churches and religious groups in the Ottawa area.

The two principal chaplains are the Reverend George Tattrie (Presbyterian-Ecumenical), who is located in T28 and T30 Tory Tunnel, and can be reached at 231-3646, and Father Michael Peterkin (Roman Catholic), who is located in 1506 Arts Tower, and can be reached at 231-3673. People are encouraged to visit these offices at any time. Appointments are not necessary, but at times they are advisable and can be arranged by the support staff in the chaplaincy offices.

There is a Quiet Room next to the chaplaincy offices in the Tory Tunnel which is used for individual meditation, religious services, and study-group activity; it is open all day, five days a week. In addition, Father Peterkin exercises a ministry at Newman House, 1061 Bronson Place, that is open to all as a drop-in centre, and that can also accommodate smaller groups who wish to meet there.

Computing Services

Carleton University Computing Services operates Xerox Sigma 9 and Honeywell Level 66 computer systems. Both operate in timesharing and batch modes with the emphasis on timesharing: over 350 computer terminals are available on the campus. The newer Honeywell Level 66 computer system has two processors, 22 megabytes of mainframe memory, and over 1.5 gigabytes of disk storage. It operates under the CP-6 system, which provides a comprehensive range of system services, including networking, inter-system electronic mail, contemporary high-level languages, and database support.

Other services available include batch access via a link to an Amdahl system at the University of Ottawa and a multi-station CP-M computer network. Mini- and microcomputer access to the mainframe facilitates the use of the specialized research machines owned by many departments.

Applications software packages available on the CP-6 system include SPSS, BMDP, SIR/DBMS, and 2nd GIMMS, to name a few. For details on available software packages, please contact the supervisor of User Services at 231-7550.

The Academic Support Group offers a consulting service that ranges from student consultants who are available at two consulting sites on campus at scheduled hours, to senior analysts who are available by appointment.

A statistical advisory service assists researchers engaged in data analysis and statistical computing. In addition to advice on the operation of specialized software packages, this service provides consultation on statistical methodology and the selection of appropriate methods for data analysis. All of this user assistance is supplemented by documentation in the form of Mini Texts (short leaflets written by Computing Services), and reference manuals available in the University Bookstore, as well as an extensive on-line documentation system.

Counselling Services

The University Counselling Services is an educational resource centre available to all members of the University community. A qualified team of counselling professionals offers the wide range of services and programs listed below.

All contacts with Counselling Services are voluntary and strictly confidential. Information is only released upon the request and consent of the client involved.

Other types of assistance include appropriate on- and off-campus referrals when required, and consultation regarding the problems of another person.

The centre is located in Room 1201 of the Arts Tower, with office hours from 9:00 A.M. to noon and from 1:00 P.M. to 5:00 P.M. Further information about services and programs may be obtained from the centre in person, or by telephone at 231-4408.

- Counselling Services

Personal counselling assists people in dealing more effectively with emotional and social concerns. Educational and career counselling involves learning to plan wisely, handle difficulties, and make decisions with regard to academic and vocational concerns. Individual and group approaches are used in providing counselling and therapy.

- Testing Service

A testing program is designed in consultation with a counsellor, and constitutes an individual assessment according to the type of self-knowledge required. Relevant information generated by interest, personality, ability, and test results is used in helping to determine goals and make choices.

- Information Services

A resource centre is maintained for use in educational and vocational planning. It includes materials on occupations, university and community college calendars, directories, and other types of career literature. Information regarding other sources of assistance at Carleton and in the greater Ottawa community is also available.

- Learning Assistance Service

Various programs and activities are designed to create learning experiences which further the development of effective reading and study skills. Testing, instruction, and practice are provided to correct difficulties, and to improve the ability to learn and study. Individual and group approaches are utilized.

- Foreign Student Advisory Service

Counselling concerning any difficulties which a foreign student may experience while at Carleton is available through this service. Student assistance is provided for academic and non-academic difficulties, financial concerns, health and immigration regulations, and adaptation problems. The Foreign Student Advisory Service may be reached at 231-3724.

- Residence Life Co-ordinating

Students living in residence can receive counselling in coping with any emotional or social concerns.

- Group Programs

These afford opportunities to be involved in a variety of experiences in which learning is best facilitated through group participation. They are offered periodically throughout the year. The nature and content of programs are publicized, along with dates and registration details.

Day Care Centre

The Day Care Centre at Carleton operates in two locations on campus, Renfrew House residence and the Loeb Building. The centre is open all year except for statutory holidays, and the hours are from 8:00 A.M. to 5:45 P.M., five days a week.

Currently, the ages of children in the centre are six months to three years, and they must leave during the month in which they reach three years. Priority is given first to children of students, then to the children of faculty and staff at Carleton. Should there be vacancies, children will be taken whose parents are not affiliated with Carleton.

There is usually a waiting list, so it is advisable to apply some months before a place is actually required.

Inquiries should be addressed to Sandra Thompson at 231-5521 (for children six months to 24 months) and Margot Henderson at 231-6312 (for children 24 months to 36 months).

Fees

Fees at Carleton are calculated on a composite basis to include tuition, the Students' Association and the Graduate Students' Association, Athletics, University Centre, and Health Services fees.

The University reserves the right to change all fees, charges, and refund policies without notice. The fee schedule published below was in effect for the academic year 1982-83 and is subject to change.

Canadian Citizens and Landed Immigrants

- Full-time

Master's Program

*(first year of full-time study)

Tuition	$528.00
Students' Association	20.15
Athletics	22.60
Health	6.45
University Centre	6.65
Total composite fee (per term)	$583.85

(second or subsequent year of full-time study)

Tuition	$158.40
Students' Association	6.05
Athletics	6.75
Health	1.95
University Centre	2.00
Total composite fee (per term)	$175.15

Doctoral Program

(first and second year of full-time study; third year of full-time study for students in a 15-course Ph.D. program)

Tuition	$528.00
Students' Association	20.15
Athletics	22.60
Health	6.45
University Centre	6.65
Total composite fee (per term)	$583.85

(third or subsequent year of full-time study)

Tuition	$158.40
Students' Association	6.05
Athletics	6.75
Health	1.95
University Centre	2.00
Total composite fee (per term)	$175.15

Qualifying Year and Diploma in Public Administration

Arts, Journalism, and Science

Total composite fee (per term) $630.75

Engineering

Total composite fee (per term) $653.25

- Part-time

Tuition	$158.40
Students' Association	6.05
Athletics	6.75
Health	1.95
University Centre	2.00
Total composite fee (per term)	$175.15

Foreign Students (In Program)

- Full-time

Master's Program

*(first year of full-time study)

Total composite fee (per term) $1,149.85

(second or subsequent year of full-time study)

Total composite fee (per term) $ 344.75

Doctoral Program

(first and second year of full-time study; third year of full-time study for students in a 15-course Ph.D. program)

Total composite fee (per term) $1,149.85

(third or subsequent year of full-time study)

Total composite fee (per term) $ 344.75

*First and second year of full-time study for students in Public Administration and Social Work.

*First and second year of full-time study for students in Public Administration and Social Work.

Qualifying Year and Diploma in Public Administration
Arts, Journalism, Science, and Engineering
Total composite fee (per term) $1,178.25

- Part-time

Total composite fee (per term) $ 344.75

An "in program" student is one who has by September 1, 1982 successfully completed, in his/her program, work equivalent to the normal load for a term of a full-time student in that program unless after September 1, 1982 he/she

- transfers more than once to another program at the same level, *or*
- registers in a program at a different level, *or*
- changes institutions (Ontario universities, Ryerson and OCA) more than once at the same level.

The "new registrant" fees apply to all other foreign students who are not exempt from the foreign student fee.

Foreign Students (New Registrants)

- Full-time

Master's Program
*(first year of full-time study)
Total composite fee (per term) $2,475.85

(second or subsequent year of full-time study)
Total composite fee (per term) $ 742.75

Doctoral Program
(first and second year of full-time study; third year of full-time study for students in a 15-course Ph.D. program)
Total composite fee (per term) $2,475.85

(third or subsequent year of full-time study)
Total composite fee (per term) $ 742.75

Qualifying Year
Arts, Journalism and Science
Total composite fee (per term) $1,568.75

*First and second year of full-time study for students in Public Administration and Social Work.

Engineering and D.P.A.
Total composite fee (per term) $2,503.75

- Part-time

Total composite fee (per term) $ 742.75

Exemptions for Foreign Students

Subject to the approval of the dean of graduate studies and research, the following categories of foreign students are exempt from the foreign students' fee indicated above, and will instead be assessed the regular tuition fee:

- Persons, or dependents of persons, admitted to Canada under diplomatic visas—Immigration Act, Section 7(1) (A)
- Dependents, excluding the spouse, of a person admitted to Canada on a special visa to practise his or her special profession for a specified period of time—Immigration Act, Section 7(1) (H)
- Persons sponsored and financially assisted by agencies such as the Canadian International Development Agency, the International Development Research Centre, etc.
- Persons studying under a reciprocal exchange agreement recognized by the Ministry of Colleges and Universities.

Persons who believe that they qualify for exemption under one of the foregoing categories must submit documentation, at the time of registration, to support their claim. University personnel will be available at that time to answer any queries.

Method of Fee Payment

Full-time and part-time fees are payable in full, by term. Winter term courses registered for in September are payable on or before January 15.

Scholarships, bursaries, and loans administered by the University will be applied first to fees, provided that this is not contrary to the terms of the award.

Personal cheques will be accepted for the payment of accounts, but the University reserves the right to cancel this policy if it is abused. A service charge of $5 will be assessed for each cheque returned to the University as non-negotiable for any reason. Students are requested to provide their own cheques when making payments.

A statement of tuition fees paid may be obtained for taxation purposes by applying to the Business Office in February.

Delinquent Accounts

Registration will not be complete until a satisfactory arrangement has been made for the payment of fees, and it may be cancelled should the student fail to meet these arrangements.

If a student owes the University *any* money at the end of an academic session, his/her account becomes delinquent.

Students with delinquent accounts will not receive examination results, are not permitted to receive transcripts, may not graduate, *and will not be permitted to register again* until all monies have been paid in full by cash or certified cheque.

Other Charges

Late Registration

Full-time Students

- $10 first week after the regular registration period
- $15 second week after the regular registration period.

Part-time Students

- $5 after the regular registration period.

Appeals

To cover administrative costs, the charge for each appeal is $25, which is refundable if the appeal is successful.

Application

To cover administrative costs, a non-refundable charge of $10 is required with each application.

Transcripts

Each student is eligible to receive one free transcript at graduation. All other transcript requests will be processed after payment is made (in advance) to the Business Office, at the rate of $2 per transcript.

Reinstatement

Students whose files have been closed as a result of failure to observe continuous registration requirements must apply for reinstatement if they wish to continue their studies. If reinstated they must pay a charge of $25, as well as the current minimum tuition fee for each term in which they have failed to register.

Deposit — Gowns and Hoods

At each convocation, the University makes available to graduating students the appropriate academic regalia. A deposit is required, which will be refunded when the regalia are returned.

Health Services

The function of Health Services is to protect and improve the physical and mental health of the students and of the University community. Its responsibilities are to provide consultation, treatment, and advice on matters of health, and to ascertain the fitness of students to perform academic work. When the necessary service cannot be provided by the program, appropriate referrals will be made. Confidentiality is respected at all times.

Health Services has regular hours and is staffed by physicians, nurses, and psychiatrists. The main clinic is on level six of the University Centre, open from 9:00 A.M. to 5:00 P.M. Appointments may be arranged by calling 231-2755.

After-Hours Service

Students who become ill when the main clinic is closed may contact the after-hours service. A nurse is in attendance from 5:00 P.M. to 9:00 A.M. Monday through Friday, and 24 hours a day on weekends. Doctors are on call for those persons requiring immediate attention during these hours. Beds are available for persons who require observation for a few hours or overnight.

The service is open from September to May, and is located at 226 Glengarry House; telephone 231-3844.

Co-ordinator for the Disabled

The co-ordinator for this program can arrange for the special services required to meet the needs of those who are disabled. Information is also available for disabled and non-disabled students, faculty, and staff. The co-ordinator may be contacted at 231-3657, or through Health Services at 231-2755.

Health Regulations

Medical insurance is compulsory for all full-time students. It is the student's responsibility to provide the insurance number when receiving medical care.

All Ontario students should be covered by OHIP. Continued coverage is not automatic after the student's twenty-first birthday and it must be applied for in the student's own name. Full-time students may be eligible for premium assistance to help pay the OHIP premium.

Students whose home residence is outside Ontario should have coverage under their own provincial plan. These claims for medical services are processed directly at Health Services.

Students entering Ontario from outside Canada and applying immediately for OHIP coverage will have effective coverage the first day of the month following application.

Tuberculosis Control

On admission to the University, every student requires a tuberculin skin test, or chest X-ray if tuberculin positive. Tuberculin skin tests are administered in Health Services, level six of the University Centre, or at provincial chest clinics.

Housing and Food Services Residences

Residences

There are currently five residence houses on the Carleton campus which accommodate a total of 1,329 students in male, female, and co-educational living arrangements.

Residence accommodation is for full-time graduate and undergraduate students. Graduate and senior undergraduate students are normally accommodated in single rooms. Graduate students are, when possible, given rooms in graduate suites in Glengarry House, or on the eleventh floor of Glengarry House. Currently, there are no facilities on campus for married students.

Residence applications are sent to students *only* when they are offered admission to full-time study at Carleton.

Off-Campus Housing

An off-campus housing information service is available to students who are unable to obtain or do not wish to have on-campus residence accommodation. The service has been established to assist out-of-town students, but is in no way a rental agency.

Listings of available accommodations are posted in the second-level corridor of the Commons Building. This area is open seven days a week, night and day. Listings of accommodation are not mailed out as such lists become outdated too rapidly.

Food Services

All students residing in residence must purchase a meal program: 14 meals a week (lunch and dinner). The breakfast plan is optional, and is not included in the residence fees.

Students living off campus may use the residence dining facilities by purchasing a campus dining plan, or eating individual meals in the dining halls. Campus dining plans purchased by students are not subject to provincial sales tax. Additional dining, cafeteria, and vending facilities are located throughout the campus.

For further information, students should contact the Student Housing Office, Room 223, Commons Building.

Library Regulations

All persons registered at the University are entitled to use the library. Graduate students may borrow most books for a period of up to four weeks, although some books are placed on "Reserve", and may be borrowed for five days only, or on an overnight basis. Alumni of Carleton University, on payment of the appropriate fee, and graduates and students of other universities, on payment of the appropriate fee, and at the discretion of the University librarian, may have limited borrowing privileges. The University participates in Ontario and Quebec inter-university borrowing arrangements, which allow students in good standing to borrow directly from other Ontario and Quebec universities.

If books are not returned to the library when due, fines and billing costs will be charged.

The book collection is protected from theft by an electronic detection system, and as a condition of use of the library facilities, all users must, if requested to do so, submit books, briefcases, bags, etc., for inspection at the exit.

Placement and Career Counselling — Canada Employment Centre

The Placement and Career Counselling Service is provided by Employment and Immigration Canada, through the establishment of an on-campus Canada Employment Centre (CEC). The CEC is located in Room 508 of the University Centre, and may be reached by phone at either 231-2600 or 996-9590. The purpose of the CEC service is twofold:

- *To provide students with readily available access to employment opportunities*

To this end, the centre maintains job boards listing part-time, summer, and permanent employment opportunities. Each year the centre also arranges for a large number of representatives from government, as well as from business and industry, both local and national, to recruit at Carleton. While the majority of these visits are for permanent employment, a number of them are arranged for undergraduates seeking summer employment. Students interested in participating in this program are advised to contact the centre upon returning to classes in the fall, as recruiting visits commence early in October.

- *To provide students with information about and assistance in preparing for entry into the labour market*

Individual and group counselling, covering such topics as career areas, labour market trends, the job hunt, and résumé preparation, is available to students seeking or preparing for employment. Students can supplement the counselling provided by reviewing materials maintained in the centre's library, as well as by contacting Counselling Services at the University.

All placement and career counselling information may be obtained by visiting the centre, or by referring to the *CEC Weekly Bulletin* posted throughout the University. The University newspapers and radio station are additional sources for information from the centre.

Student Government

All registered students, full- and part-time, are members of the Students' Association. The Students' Association has many functions: providing services to students, creating community awareness of our campus, and representing student views on a wide range of interests both internally and externally.

The legislative body of the association is the Students' Council, elected in February for a 12-month term beginning the following May. The graduate representative is chosen by the GSA in October. The February election sees selection of the president, finance commissioner, and faculty representatives; the vice-presidents are chosen by the president from among these representatives, and ratified by council shortly thereafter.

The Students' Association provides numerous services, including Oliver's Pub, Rooster's Coffee House, Peer Counselling, the Women's Centre, Information Carleton, the Games Area, The Store, and others. It funds *The Charlatan*, the campus newsmagazine, which is published by the Joint Publishing Board, a CUSA/Charlatan management committee. CUSA also helps fund CKCU-Radio Carleton, an FM station which broadcasts on 93.1, that is heard all over the national capital region and in points of eastern Ontario.

Many Students' Association operations emanate from the University Centre, with policy set by the Students' Council. The Unicentre, open from 7:30 A.M. to 2:00 A.M. most days, includes, in addition to the CUSA operations, facilities for food service, a faculty club, lounges, Health Services, the Canada Employment Centre, and the Ontario Public Interest Research Group (OPIRG).

Students' interests are represented by the association's membership in the Canadian Federation of Students, and by the on-campus work of the Students' Council on issues ranging from government cutbacks to housing shortages and bus-route alterations. To aid in this work, CUSA has a full-

time staff, which works to benefit and improve the association and its membership.

The Students' Association offices are located in Room 401 of the Unicentre, and may be reached by phone at 231-4380.

Student Participation in Academic Affairs

New University Government (N.U.G.) is a governing system wherein all faculty members and some students are formally involved in the government of the University at the departmental, faculty board, and Senate levels.

The first level is election to the faculty and departmental boards through a general election among all the graduate students in the various departments. From here, it is possible to get support from a majority of faculty and get elected to Senate.

General Information

Awards Policy

In recent years Carleton graduate students have won a large number of external scholarships, such as SSHRC fellowships and NSERC and Ontario government scholarships. In addition, the University itself provides generous support, and the majority of graduate students receive funds from this source.

Holders of awards must pay regular tuition fees unless otherwise stated.

Full-time graduate students at Carleton are expected to comply with the following procedures:

- Any full-time graduate student who accepts an award that is not directly administered by Carleton University must immediately inform his departmental chairman and the dean of graduate studies and research in writing. This requirement applies to any awards or assistance offered by any agency or institution.
- Any full-time graduate student who accepts part-time employment outside the University is required to inform his departmental chairman and the dean of graduate studies and research, in writing, prior to undertaking the work.

Application Deadlines

March 11 is the last date for receipt of completed applications for admission (including transcripts, letters of reference, etc.) from candidates who wish to be considered for the initial award, announced April 1, of financial assistance administered by Carleton University.

Candidates whose applications are received after the March 11 deadline may be eligible for the award of a scholarship and assistantship by reversion. These are normally considered on or about May 15, August 15, and October 1.

Method of Payment

All awards administered by Carleton University will be paid on a monthly basis, with the first instalment on *October 1.*

Students are urged to note the above payment dates and be prepared to be financially self-sufficient during the month of September.

Other Awards

A number of national and provincial organizations award fellowships and scholarships that are tenable at Carleton University (for example, SSHRC, NSERC, etc.) Some application procedures and regulations concerning fellowships awarded by agencies other than Carleton University are given in the description of each of these awards.

In addition, a large number of foundations, companies, fraternal organizations, and other agencies offer fellowships and scholarships. A booklet providing details of deadlines and application procedures has been compiled and may be consulted in the Graduate Studies and Research Office.

Eligibility

In the case of fellowships, grants, scholarships, etc., for which students must make application, it is the individual student's responsibility to establish his/her eligibility. Should it become known that a student is unqualified for any reason, he/she must return the funds already received, with the University assuming no responsibility.

Departments recommending students for internal awards must accept full responsibility for the eligibility of their nominees.

Students are urged to consult carefully the brochures and announcements which specify the conditions associated with tenure of individual awards. This information is available in the Graduate Studies and Research Office and in departmental offices. An up-to-date listing of awards is published in the Carleton University newspaper, *This Week at Carleton.*

Awards Administered by Carleton University

The awards administered by Carleton University are derived from a variety of sources. Throughout the years, a number of individuals and organizations have contributed substantial funds to the University, through bequests and donations, in order to help support students in various fields of study.

It is not always possible to identify precisely the sources of various donations and bequests (often small, but most important in the aggregate) from which any graduate student's financial support has been constructed. These sums, together with the assistantship funds made available from the University budget, make up the reservoir from which the Carleton scholarships and assistantships are drawn.

In the following cases, however, either because of the relative importance of the contribution or because of the fact that it is earmarked for a specific type of student or program, we do identify the external source from which the award has originated.

Fred Barkley Special Bursary

This bursary, in the amount of $500, is awarded annually to a graduate student from a developing country who requires special financial assistance in order to study at Carleton University. The recipient of the award will be announced by the dean of graduate studies and research in October each year.

Harold Bernstein Award in Physical Chemistry

This grant, valued at approximately $1,000, will be awarded annually to a student joining the graduate program of the Ottawa-Carleton Institute to study and do research in the area of physical chemistry. It is a one-time scholarship, and is additional to all other stipends or scholarships that the student may hold.

The award is named in honour of Dr. Harold J. Bernstein, eminent spectroscopist and researcher, who retired from the National Research Council, Ottawa, in 1979. Dr. Bernstein served as an adjunct professor of chemistry at Carleton University from 1970 to 1979.

R.F. Chinnick Memorial Scholarship

This scholarship is provided by Telesat Canada in memory of R.F. Chinnick, their former vice-president of engineering and operations. It is awarded annually, where appropriate, to a student enrolled in a graduate program in electrical engineering who is working in the field of satellite communications, or whose work has direct relevance to this area of telecommunications.

It is normally awarded in the second or subsequent year of graduate work, when the student's area of specialization has been well established. It may be awarded more than once to the same student, and if an award is not appropriate in a given year, it will be held over so as to allow more than one recipient in a subsequent year.

David and Rachel Epstein Foundation Scholarships

Part of the income from the David and Rachel Epstein Foundation Fund has been designated to provide scholarships, established in 1970, for outstanding graduate students at Carleton University. They may be held in combination with a teaching or research assistantship.

Application is not required; recipients are chosen from the list of candidates recommended by each department.

Neil Huckvale Memorial Scholarship

This award was established in 1981 by family, friends, and colleagues in honour of Neil Huckvale, a former graduate student in the Department of Geography. The recipient will reflect Neil Huckvale's humanity and philosophy, and will be chosen on the basis of merit and special interest in teaching and resource conservation.

The scholarship will normally be awarded annually to a student enrolled in the third or subsequent term of a graduate program in geography. It may be held in combination with a teaching or research assistantship. Application is not required; the recipient will be selected on the recommendation of the graduate studies committee. If an award is not appropriate in a given year, it will be held over so as to allow more than one recipient in a subsequent year.

I.O.D.E. Eva Leadley Clark Award

Through the sponsorship of the Amelia F. Sims Chapter, I.O.D.E., a scholarship derived from a legacy by the late Eva Leadley Clark is offered annually to a Canadian citizen entering the Master of Journalism program.

The scholarship, valued at $1,000, will be awarded to a deserving student who has shown excellent potential in the field of journalism. Preference will be given to a female student.

Zbigniew A. Jordan Scholarship

This award, established in 1978 by friends and colleagues in honour of the late Professor Zbigniew A. Jordan, is open to all graduate students in sociology.

Application is not required; the recipient will be chosen by the awards committee from candidates recommended by the Department of Sociology and Anthropology on the basis of merit and special interest in sociological theory and the philosophy of social sciences.

R.A. MacKay Memorial Fund

This fund was established in 1980 by relatives, friends, and former colleagues of the late R.A. MacKay, a distinguished scholar in Canadian government, a senior member of the Department of External Affairs, Professor of Political Science at Carleton University from 1961, and founding associate director of the Norman Paterson School of International Affairs, 1966-68.

The award is intended to assist graduate students from outside Canada who are studying international affairs at Carleton University; they may be enrolled in the Norman Paterson School of International Affairs or come from a related discipline, such as political science, history, or economics, provided that the "international" component of their course of study is prominent.

R.O. MacFarlane Memorial Book Award

This award is presented annually to an outstanding student registered in a graduate program in the School of Public Administration at Carleton University. Endowed in 1971 by relatives, friends, and graduates of Carleton University, the award is named in honour of the late R. Oliver MacFarlane, first director of the School of Public Administration, 1953-71.

Roy Buckley Morrison Scholarship

This scholarship was established in 1979 in honour of the late Roy Buckley Morrison by Panasonic/Matsushita Electric of Canada Limited, and friends and associates. It will normally be awarded to a Canadian citizen or permanent resident of Canada, registered in the Norman Paterson School of International Affairs.

Application is not required; the recipient will be chosen by the awards committee from candidates recommended by the school on the basis of merit and special interest in conflict analysis and/or studies in strategy and security.

Paterson Fellowships

From the generous support provided by the Honourable Norman M. Paterson when the school was established in 1966, funds are allocated to support some candidates for the M.A. degree in the Norman Paterson School of International Affairs.

All those with high standing who are admitted to this program are considered for these fellowships.

The Norman Pollock Memorial Award for Canadian Jewish Studies

This award, endowed by David A. Pollock and Susan A. Harkavy, will be granted annually to an outstanding graduate student in the Institute of Canadian Studies for research in Canadian Jewish studies. Part of the award may be allocated towards underwriting the cost of publication of this research.

No application is required; the recipient will be selected on the recommendation of the director of the Institute of Canadian Studies. In a given year, the award may not be made for lack of eligible candidates.

The John Porter Publication Grant

This grant, established in 1979 by friends and colleagues of the late John Porter, will be awarded annually and is open to authors of book-length works. The applicants must be members of the Carleton University community whose manuscripts have been accepted by a reputable publisher, *or* persons not affiliated with Carleton University, whose manuscripts have been accepted for publication in the Carleton Library series.

The award, which carries a value of $1,000 (to be applied against the costs of publication of the work), will be made on the basis of overall merit and contribution to the literature dealing with aspects of Canadian society. The recipient will be expected to deliver a public university lecture on the topic of the book, at or near the time of publication.

Applications or nominations should be directed to the Grants Committee, appointed by the Vice-President (Academic). The committee may decline to make an award in a given year for lack of meritorious candidates.

William Roxburgh Memorial Award

This award was established in 1981 by Gwenda and Ross Roxburgh, and is open to all graduate students in the Institute of Canadian Studies. The amount of $100 is provided annually to assist students in carrying out research projects.

Application should be made to the director of the Institute of Canadian Studies; recipients will be chosen from a list of candidates recommended by the director.

John Ruptash Memorial Fellowship

This fellowship was established in 1974 by relatives, former students, faculty colleagues and friends as a memorial to the late John Ruptash, who was dean of engineering and later dean of graduate studies from 1959 to 1973. The fellowship has been awarded annually, beginning in 1975-76, to an outstanding graduate student in the Faculty of Engineering; it may be held in combination with a teaching or research assistantship. Application is not required; the recipient will be chosen by the awards committee from candidates recommended by the Faculty of Engineering.

TIME Canada Graduate Scholarship in Journalism

Established in 1974, this scholarship, which carries a value of $1,000, will be granted annually on the basis of academic and professional excellence to a student entering the Master of Journalism program.

Application is not required; the recipient will be chosen from a list of candidates recommended by the School of Journalism.

Philip E. Uren Fellowship

This fellowship is awarded annually to a graduate student in either the Department of Geography or the Norman Paterson School of International Affairs; it may be held in combination with a teaching or research assistantship. Application is not required; the recipient will be chosen by the awards committee from the units involved. The fellowship was established in 1980 by relatives, friends, former students, and faculty and staff colleagues as a memorial to the late Philip Ernest Uren who was a professor of geography between 1965 and 1979, and who served the University as chairman of the Department of Geography, director of the Institute of Soviet and East European Studies, director of the Norman Paterson School of International Affairs, and director of the Paterson Centre for International Programs.

Charlotte Whitton Fellowships in Canadian Urban Life

In honour of the distinguished contribution of the late Charlotte Whitton to Canadian urban life and politics, and her long association with Ottawa, up to two fellowships in urban life will be awarded annually to the student(s) in the Institute of Canadian Studies with the highest standing on admission. The proposed field(s) of study must relate to urban life and problems.

The recipient(s) will be chosen by the dean of graduate studies and research on the advice of the director of the Institute of Canadian Studies.

The Susan Joan Wood Fellowships in Canadian Literature

Two graduate fellowships provided for in the will of Susan Joan Wood, an outstanding scholar and student in the field, will normally be awarded annually to candidates for the Ph.D. degree in the Department of English; each fellowship is valued at $2,500. All students admitted to the Ph.D. program will be considered for the awards; final decisions to be made by the department through its appropriate committee.

Xerox Canada Inc. Graduate Scholarship in Public Administration

This award of $3,000 is presented annually to an outstanding student entering the first year of the M.A. program in the School of Public Administration. Established in 1980, the scholarship is provided by Xerox Canada Inc.

Graduate Bursaries

A full-time graduate student who experiences *unexpected* financial need, after completion of

five weeks from the date of most recent registration, may be awarded a bursary of up to $200 for that term (with a maximum of $500 for three consecutive terms). Application forms are available from departments and from the Graduate Studies and Research Office.

Residence Fellowships

Residence fellowships for men and women, providing free accommodation and meals for one academic year, are available to students of Carleton University. Applications are invited from graduate and senior undergraduate students with good academic standing.

Application forms may be obtained from the Student Housing and Food Services Office, Carleton University, Ottawa, Ontario K1S 5B6. Deadline is January 30.

Special Bursary for Students in Social Work

This bursary, in the amount of $1,000 annually, may be awarded to one, or divided between two students in the School of Social Work who require special financial assistance in order to complete their studies at Carleton University. The selection of the recipient(s) will be decided on the recommendation of the director of the School of Social Work.

Awards Tenable at Carleton University

Canada Mortgage and Housing Corporation Scholarships

The Canada Mortgage and Housing Corporation offers graduate scholarships for full-time study in various fields related to housing in its urban and regional context.

This competition is open only to Canadian citizens or landed immigrants who wish to study the social, physical, environmental, economic, legislative, or administrative aspects of housing. The value of a CMHC University Scholarship is $8,904 per annum personal allowance, plus cost of travel from residence to place of study, university tuition fees, and $1,424 for each dependent child. The scholarship is tenable at a Canadian university only.

Application forms, which are available in the Graduate Studies and Research Office, must be submitted by February 28 for transmission to CMHC by March 15.

Commonwealth Scholarships and Fellowships

The Government of Canada, through the Commonwealth Scholarships and Fellowships Committee, offers annually a number of scholarships and fellowships, normally tenable for two years, which cover such expenses as travelling costs, tuition fees, other university fees, and a living allowance, to students of other Commonwealth countries.

Under a plan drawn up at a conference held in Oxford in 1959, these scholarships and fellowships are awarded mainly for graduate study, and are tenable in the country making the offer.

Students are advised to consult the Graduate Studies and Research Office for details of the terms of the awards, or to write to the Association of Universities and Colleges of Canada, 151 Slater Street, Ottawa, Ontario K1P 5N1.

Persons intending to apply for the year 1984-85 are advised to inquire not later than mid-October, approximately one year prior to the date of tenure.

Gulf Oil Canada Limited Graduate Fellowships

Ten graduate fellowships will be awarded annually to candidates in business and management studies, computer sciences, mathematics, geology, geophysics, engineering, physics, chemistry, ecologically-oriented studies, and other sciences related to the petroleum industry.

The fellowships, tenable at any Canadian university or college which is a member, or affiliated member of AUCC, are open to Canadian citizens or landed immigrants. Each fellowship is valued at $9,000. ($8,000 will be paid to the successful candidate and $1,000 will be paid to the relevant department of the receiving university in which the fellow is registered.)

Further information and application forms are available through the Association of Universities

and Colleges of Canada, 151 Slater Street, Ottawa, Ontario K1P 5N1. Deadline is February 1.

Imperial Oil Graduate Research Fellowships

Six fellowships are offered by Imperial Oil: three in the pure or applied natural and exact sciences, and three in the social sciences and humanities. These are valued at $7,000 each per annum for a period of up to three academic years, and are open to any Canadian graduate of an approved university for research leading to the doctoral degree.

Application forms are available from the Graduate Studies and Research Office. Deadline is February 1.

I.O.D.E. War Memorial Scholarships

Ten scholarships are offered annually by the Imperial Order Daughters of the Empire for postgraduate study and research in the humanities or social sciences. The awards are valued at $10,000 for study in Britain or another country in the Commonwealth, and $5,500 for study in a Canadian university.

Candidates must be Canadian citizens and graduates of recognized colleges or universities.

Additional information and application forms may be obtained by writing to Mrs. P.C. Cockburn, I.O.D.E. War Memorial Convener, 606-807B Frederick Street, Kitchener, Ontario N2B 2B4. Deadline is December 1.

Canada Department of Labour University Research Program

Grants ranging up to $5,000 a year are provided for research studies in the field of industrial relations and labour economics. Applications are accepted from graduate students and university faculty members, provided they are Canadian citizens or can demonstrate they will be residing in Canada on a continuing basis. Further information and application forms are available from the Secretary, Department of Labour, University Research Committee, Economics and Research Branch, Canada Department of Labour, Ottawa, Ontario K1A 0J2. Applications must be received by February 15.

Sir John A. Macdonald Graduate Fellowship in Canadian History

The Province of Ontario annually offers the Sir John A. Macdonald Graduate Fellowship, valued at $6,500, for full-time graduate studies and research in the field of Canadian history at the Ph.D. level. The fellowship is tenable for three years, at an Ontario university only, and it will be awarded to a Canadian citizen resident in Ontario.

Application forms and additional information can be obtained from the Graduate Studies and Research Office. The deadline date for submission of completed applications to the dean of graduate studies and research is February 15.

Awards for Research and Study in Mental Retardation

The National Institute on Mental Retardation offers two awards to students entering or pursuing graduate studies: Type A offers up to $7,500, plus a travel/training award for a one-year period; Type B offers supplementary funding of up to $2,000 per year for two years. The awards are tenable in a wide area of study, and are not limited to fields directly associated with mental retardation. The deadline for applications for Type A is February 15, and for Type B, April 15.

Department of National Defence Scholarships and Fellowships

The Department of National Defence offers scholarships and fellowships for strategic studies of relevance to current and future Canadian national security problems, including their political, economic, social, and military dimensions. Applicants must be Canadian citizens and must, before closing date of the competition, hold a Ph.D. degree or equivalent (for the fellowship) and for the scholarship, a candidate must hold an honours bachelor's degree or equivalent.

Awards are valued at $17,000 and $8,500 respectively. Deadline is February 1.

Natural Sciences and Engineering Research Council

NSERC Postgraduate Scholarships ($10,500 for 12 months, plus travel) are tenable at Carleton

University by students undertaking advanced studies and research in science, engineering, experimental psychology, and physical geography.

Students currently enrolled at Carleton University must apply through their departments, on or before November 1, on prescribed forms available from the Graduate Studies and Research Office.

1967 Science Scholarships

NSERC annually offers 1967 Science Scholarships, valued at $15,750 for 12 months, plus a travel grant.

The university selection committee will determine which, if any, of the candidates for postgraduate scholarships (for a first year of graduate studies) are sufficiently outstanding to be nominated for a 1967 Science Scholarship. Applications (including supporting documents) must be sent to the Graduate Studies and Research Office by November 1.

These awards are tenable in any Canadian university other than the one from which the candidate expects to receive his/her bachelor's degree.

Noranda Fellowships for Postgraduate Studies in Science and Engineering

To stimulate pure and applied research in mining and metallurgy in Canada, the Noranda Group of Companies invites applications for a number of fellowships valued at $10,000 per annum each ($9,500 for the fellow, plus $500 for equipment and other expenses).

The fellowships will be granted for research related to mining and metallurgy in the fields of chemical engineering, chemistry, ecology, electrochemistry, extractive metallurgy, forestry, materials science, mineral engineering, mining, and physical metallurgy.

Application should be made through the appropriate university department to the Director of Research and Development, Centre de Recherche Noranda, 240 Hymus Boulevard, Pointe Claire, Quebec, H9R 1G5, not later than April 1.

Ontario Graduate Scholarships

The Province of Ontario annually offers scholarships of $2,090 per term to applicants with a high level of academic achievement (first-class standing in most courses) who intend to pursue graduate studies at an Ontario university. These awards are not available to students in a qualifying or "make-up" year.

Completed application forms must be submitted through the Graduate Studies and Research Office no later than November 1.

The Queen Elizabeth II Ontario Scholarships

The Queen Elizabeth II Ontario Scholarship Fund provides a number of annual awards, valued at $11,000, plus a general expense allowance of $500, for candidates expecting to be in the final year of their Ph.D. research and writing during their tenure of the award.

The scholarships, open only to Canadian citizens and landed immigrants, are tenable only at Ontario universities. Preference will be given to candidates who are residents of Ontario.

Prescribed application forms are to be completed and submitted to the dean of the Faculty of Graduate Studies and Research by December 1 for transmission to the selection committee by December 15.

J.H. Stewart Reid Memorial Fellowship

This fellowship provides an award of $5,000 for 12 months for any field of study in a graduate program in any Canadian university. It is open to students who are Canadian citizens, or who have held landed immigrant status from February 1, 1978 and have been admitted to a Canadian graduate program by the time of award. Applications, due February 27, may be obtained from the awards officer, Canadian Association of University Teachers, 66 Lisgar Street, Ottawa, Ontario K2P 0C1.

Social Sciences and Humanities Research Council of Canada

The council offers fellowships ranging in value up to $10,800 for studies and research at the doctoral level in the humanities and social sciences.

These fellowships are tenable in Canada or abroad for a maximum of 12 months and may be renewed upon application.

Application forms and brochures containing details of the assistance programs available may be obtained from the Graduate Studies and Research

Office, or from the chairman of the department concerned, or by writing to the council, P.O. Box 1610, Ottawa, Ontario, K1P 6G4. Applications must be submitted by November 15.

Special M.A. Scholarships and The Queen's Fellowships

To be eligible for these awards, (offered by SSHRC) a student must be nominated by a faculty member of a Canadian university and be in his/her final year of an honours B.A. program (or its equivalent) at a Canadian university, or hold an honours B.A. degree (or its equivalent) from a Canadian university and not yet have begun a master's program. Nominees must be Canadian citizens, have first-class standing in their present program or previous programs, and intend to pursue full-time graduate studies at a Canadian university.

The value of the award is $10,800, plus travel allowance for the award holder only, and it is tenable for 12 months. The Queen's Fellowships also include tuition fees. Nomination forms are included in the application forms, which must be submitted by December 15.

Transport Canada Fellowships and Assistantships in Transportation

Transport Canada awards a number of fellowships valued at $9,000 - $10,000 for 12 months (master's and Ph.D. levels) for full-time graduate study in any discipline related to transportation.

Applicants must be Canadian citizens or landed immigrants. The awards are tenable at any Canadian university, but in special circumstances doctoral awards may be approved for tenure outside of Canada.

Application forms may be obtained from the Graduate Studies and Research Office, or from Transport Canada (Ottawa). Completed applications must be postmarked no later than January 19.

Grants and Loans

Ontario Student Assistance Program

Ontario residents who are Canadian citizens or landed immigrants (permanent residents) should apply for financial aid from the Ontario Student Assistance Program (OSAP). The program covers the following plans.

Canada Student Loans Plan

For students who qualify, this plan makes interest-free loans available for post-secondary study. To be eligible for a Canada Student Loan, the applicant must be taking at least 60 percent of a full course load. The amount of loan is based on the student's calculated financial need.

Ontario Student Loans Plan

A student's application for OSAP assistance may be supplemented automatically by the Ontario Student Loans Plan if his/her calculated financial need is not fully covered by the Canada Student Loans Plan. This provincial loans plan also helps part-time students, or students enrolled in some short courses which are not covered by the other plans.

Students are not obliged to borrow the full amount of their authorized loan under either the Canada Student Loans Plan or the Ontario Student Loans Plan.

Ontario Study Grant Plan

For students who qualify, this plan provides grants to assist with post-secondary education for up to eight terms (or eight grant eligibility periods) of full-time study or its equivalent. Students continuing post-secondary study beyond the eight terms are eligible to apply to the Canada Student Loans Plan and the Ontario Student Loans Plan.

Application forms and a brochure containing details of the plan, including conditions of eligibility, may be obtained from the Awards Office.

Departmental Program Descriptions and Details of Courses

Faculty of Arts

Dean: N.E.S. Griffiths

The Department

Chairman of the Department: Marilyn Marshall
Departmental Graduate Co-ordinator: Roger Mesley

The Department of Art History offers three courses at the graduate level, under the aegis of the Institute of Canadian Studies.

Graduate Courses*

• Art History 11.505T2
Selected Aspects of Canadian Art History
A tutorial to study specific areas of Canadian art in the Pre-Confederation and Post-Confederation periods. For the focus of the course in the current year, please consult the department.
Prerequisite: Honours courses in art history or permission of the department.

• Art History 11.506F1, W1, S1
Directed Reading and Research
Tutorials designed to permit advanced students to pursue topics in Canadian art which they have selected in consultation with the staff.
Prerequisite: Permission of the department and the Institute of Canadian Studies.
Departmental co-ordinator and members of the curatorial staffs, National Museums of Canada.

Courses Not Offered in 1983-84

11.507 Selected Aspects of Prehistoric and Contemporary Inuit Art

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

Institute of Canadian Studies

The Institute

Director of the Institute: R.T. Clippingdale
Associate Director: J.M. Vickers
Co-ordinator, Northern and Native Studies: G.W. Rowley
Visiting Fellow: Davidson Dunton

The Institute of Canadian Studies offers a program of study and research leading to the degree of Master of Arts in Canadian Studies.

Through the medium of the institute, the following departments co-operate in offering the programs: Art History, Economics, English, Film Studies, French, Geography, History, Journalism, Law, Linguistics, Music, Political Science, Psychology, Public Administration, Social Work, and Sociology and Anthropology.

The Canadian studies program is interdisciplinary in emphasis. It enables students in the institute to develop individual areas of concentration to meet particular interests in a broad range of Canadian issues.

Special areas of concentration include modern Canada; communications; regional studies; urban studies; French-Canadian studies; native peoples; the Canadian north; Canadian art history and music; and studies in Canadian literature.

The proximity of Carleton University to the National Library, the National Gallery of Canada, the national museums, the Library of Parliament, the Public Archives of Canada, Statistics Canada, and the libraries of various government departments and embassies, ensures excellent research facilities for graduate candidates in Canadian studies.

With the aid of a grant from the Donner Foundation, the institute has initiated a new program area of northern and native studies. The same conditions and requirements apply as in other program areas; however, special consideration may be given to candidates for admission who have extensive knowledge of the north or of native peoples, and the language requirement may be met by a demonstrated knowledge of an aboriginal Canadian language in addition to English or French.

Beginning in the 1983-84 academic year, the institute is initiating a new program area of women's studies. It will be both interdisciplinary and comparative in focus, permitting students to examine the interplay within the Canadian context between gender and race, gender and nationality, gender and class; and sex/gender as a dynamic principle in the process of imperialism, nation building, and the construction of national and ethnic identities.

Qualifying-Year Program

Applicants with general (pass) bachelor's degrees with second-class standing will be required to complete successfully a qualifying year of study before proceeding to the master's program.

Refer to the general section of this calendar for the regulations governing the qualifying year.

Master of Arts

Admission Requirements

Applicants must normally hold an honours B.A. (or the equivalent), with at least high second-class standing, in one of the disciplines represented in the institute.

Language Requirement

The institute requires a reading knowledge of French from its students. This requirement may be met in one of two ways:

- Successful completion of a 100-level French course or its equivalent, preferably French 20.106 or 20.108
- Successful completion of a language examination.

The institute conducts the language examinations at stated times throughout the year. Students choosing the first option should note that examination results in these courses form part of their record, although they are additional to the course requirements for the degree.

Program Requirements

The minimum requirements for the master's program are outlined in the general section of this calendar. The Institute of Canadian Studies speci-

fies that all candidates must select one of the following program patterns:

- Three full courses or the equivalent, a thesis, and an oral examination
- Four full courses or the equivalent, a research essay, and an oral examination.

Whichever pattern is selected, all institute students are required to take the interdisciplinary seminar, Canadian Studies 12.500, 12.510, or 12.520.

Graduate Courses*

- Canadian Studies 12.500T2
Modern Concepts of Canada
Interdisciplinary seminar.
R.T. Clippingdale.

- Canadian Studies 12.510T2
Northern and Native Issues
Interdisciplinary seminar. The significance of the north to Canada, and the position of the native people in Canadian society. The impact of resource development and modern technology on both the north and the native people.
V.F. Valentine and G.W. Rowley.

- Canadian Studies 12.520T2
Women's Studies
Interdisciplinary seminar. The significance in the Canadian experience of sex/gender in the dynamics of imperialism, nation building, class differentiation, and the construction of culture; Canadian feminist theory and the history of women's movements.
J.M. Vickers.

- Canadian Studies 12.590T2, S2
Directed Studies
Reading and research tutorials.

- Canadian Studies 12.591F1, W1, S1
Directed Studies
Reading and research tutorials.

- Canadian Studies 12.592T2, S2
Directed Studies
Reading and research tutorials.

- Canadian Studies 12.593F1, W1, S1
Directed Studies
Reading and research tutorials.

- Canadian Studies 12.598F2, W2, S2
Research Essay

- Canadian Studies 12.599F4, W4, S4
M.A. Thesis

Selection of Courses

In addition to the graduate courses offered by the institute, the following courses are of particular relevance to students in Canadian studies. The list is not exclusive and is subject to change. Master's students in the institute must complete at least four courses, or the equivalent, at the 500 level, with the possibility of one course at the 400 level.

Anthropology
54.516 Selected Topics in North American Studies
54.475 Contemporary Problems in Anthropology
54.522 The Anthropology of Underdevelopment
54.541 Anthropological Problems
54.542 Explanatory Frameworks in Anthropology
54.587 Problems in North American Ethnohistory

Art History
11.400 Canadian Artists and Architects
11.403 Contemporary Inuit Art in the Context of Art History
11.490 Directed Readings and Research
11.491 Directed Readings and Research
11.505 Selected Aspects of Canadian Art History
11.506 Directed Readings and Research
11.507 Selected Aspects of Contemporary Inuit Art

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

Comparative Literature
17.400 Foundations of Comparative Literature
17.500 Theory of Literature and Standard Problems in Comparative Literature
17.506 Women and Fiction: The Period Between the World Wars

Economics
43.435 Manpower Economics and Labour Policy
43.465 Industrial Relations
43.480 Urban Economics
43.511 Canadian Economy I
43.512 Canadian Economy II
43.531 Firms and Markets
43.532 Competition Policy
43.533 Regulation and Public Enterprise
43.541 Public Economics: Expenditure
43.542 Public Economics: Taxation
43.581 Regional Analysis
43.582 Urban Analysis

English
18.581 Canadian Poetry
18.585 Canadian English
18.587 Selected Topic in Canadian Literature
18.588 Studies in Canadian Literature

Film Studies
19.528 Canadian Cinema

French
20.551 Critique sociologique et idéologique: Gaston Miron et le mouvement poétique des années 60
20.571 La femme et l'écriture au Québec

Geography
45.421 Selected Themes in Urban Geography
45.442 Transportation Geography
45.546 Geographical Insights to Canadian Problems
45.570 Problems of Development in Arctic and Subarctic Environments
45.572 Issues in Canadian Resource Development
45.579 Research and Development in Recreational Geography

History
24.430 The Formation of British North American Societies, 1760-1848
24.431 The Making of the Nation, 1849-1896
24.437 The National Experience, 1896-1939
24.439 Modern Canada, 1939-1976
24.442 North American Colonial Rebellions and Independence Movements, 1675-1837
24.459 Selected Problems in the History of Women and the Family: from the Industrial Revolution
24.491 Directed Studies
24.500 A Practicum in Applied History
24.531 French Canada since Confederation
24.532 Studies in the Economic and Social History of Ontario in the Nineteenth Century
24.534 Problems in Growth and War in Canada, 1896-1921
24.535 Canada in the North Atlantic World, 1900-1949
24.537 The Maritimes in Transition, 1840's to 1890's
24.538 The Indian Peoples of Eastern British North America, 1763-1867
24.539 Acadian Society, 1604-1967
24.588 Historiography

Journalism
28.411 Selected Problems in Mass-Communication Analysis
28.434 Media and Society I
28.435 Media and Society II
28.461 Perspectives on Modern Society
28.462 Public Issues in Canada
28.530 Mass Media/Mass Society
28.532 Press and Government

Law
51.441 Labour Law
51.445 Labour Relations in the Public Service
51.450 Canadian Constitutional Law
51.456 Administrative Law I
51.457 Administrative Law II
51.487 Québec Civil Law
51.550 The Canadian Constitution
51.553 Advanced Legal Problems of Federalism
51.556 Advanced Administrative Law Problems
51.590 Tutorials/Directed Readings in Law

Music
30.510 History of Canadian Music I
30.511 History of Canadian Music II
30.512 History of Canadian Music III

Political Science
47.400 Topics in Canadian Government and Politics
47.401 Policy Making in Canada

47.402 Problems in Northern Development
47.403 Politics and the Media
47.404 Interest Groups in Canadian Politics
47.405 Federalism
47.406 Legislative Process in Canada
47.407 The Politics of Law Enforcement in Canada
47.408 National Security and Intelligence in the Modern State
47.409 French-Canadian Politics
47.500 Canadian Local Government and Politics
47.501 Canadian Provincial Government and Politics
47.503 Political Parties in Canada
47.506 Problems of Canadian Government and Politics: I
47.507 Problems of Canadian Government and Politics: II
47.508 The Politics of Energy and the Environment
47.509 Canadian Political Economy
47.510 The Political Process in Canada
47.511 Canadian Federalism
47.520 Nationalism
47.521 Politics in Plural Societies
47.535 The Canadian and American Political Traditions
47.540 Canadian Public Administration and Policy Analysis
47.561 Analysis of Canadian Foreign Policy

Psychology
49.590 Directed Study

Public Administration
50.500 Public-Sector Managing and the Canadian Political System
50.515 Management in the Public Service
50.516 Urban and Local Government Management
50.565 Government-Industry Policy Relations
50.567 Public Sector-Private Sector Relations
50.573 Policy Seminar
50.584 Industrial Relations and Collective Bargaining
50.585 Public-Sector Collective Bargaining

Social Work
52.502 Economics of Welfare
52.503 Foundations of Sexuality
52.504 Social Work and the Law
52.506 Women and Welfare
52.510 History and Philosophy of Social Welfare
52.511 Social Policy Analysis
52.514 Housing Policy
52.515 Poverty and Wealth
52.517 Social Policies for Children
52.544 Program Implementation Analysis
52.545 Industrial Relations and Social Work

Sociology
53.525 Canadian Society
53.530 Social Institutions I
53.531 Social Institutions II
53.532 The Labour Process
53.540 Political Sociology
53.545 Power and Stratification
53.583 Departmental Seminar: Canada — The Thirties and the Eighties

Department of Classics

The Department

Chairman of the Department: D.G. Beer
Departmental Supervisor of Graduate Studies: R.C. Blockley

The Department of Classics offers programs of study leading to the degree of Master of Arts. The following three program categories are available:

- Classics
- Greek only
- Latin only
- Ancient History

Qualifying-Year Program

Applicants who hold a general (pass) B.A. degree will normally be required to complete successfully a qualifying-year program before proceeding to the master's program. Refer to the general section of this calendar for the regulations governing a qualifying year.

Program Requirements

The qualifying-year program will correspond quite closely to the final year of the honours undergraduate program offered by the Department of Classics, although it may include graduate courses.

Master of Arts

Admission Requirements

The minimum requirement for admission to the master's program is an honours B.A. degree in Classical Civilization, Ancient History, Classics, Latin, or Greek, with high second-class standing.

Program Requirements

The regulations governing program requirements are outlined in the general section of this calendar. Master's students will normally be required to complete three full courses (or the equivalent) at the 500 level, and a thesis equivalent to two full courses.

The department also specifies the following:

- Students entering the program with a degree in classical civilization must have a knowledge of Latin or Greek to the 200 level (or the equivalent) and the other of the two languages to the level of 115 (or the equivalent). A minimum grade of B– will normally be required in these language courses. In special circumstances, the department will allow a student to enter the master's program with less than these requirements, but in that case, the student will have to reach the necessary standard before graduation.
- Students taking the degree in Greek only must have credit in senior matriculation Latin, or an approved equivalent; those in Latin only must have credit in Greek 15.115 (or the equivalent). A minimum grade of B– will normally be required.
- All students must demonstrate a knowledge of German. Credit in German 22.115, or an approved equivalent, will be accepted.

Graduate Courses*

- Classics 14.505F1
Introduction to Linguistics
- Classics 14.506W1
Elementary Textual Criticism
- Classics 14.520T2
A Greek Author
- Classics 14.521T2
A Latin Author
- Classics 14.530T2
A Greek Literary Genre
- Classics 14.531T2
A Latin Literary Genre
- Classics 14.550T2
A Greek Historical Period

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

- Classics 14.551T2
A Roman Historical Period

- Classics 14.552T2
A Topic in Greek and Roman History

- Classics 14.599F4, W4, S4
M.A. Thesis

Comparative Literature Committee

The Committee

Chairman of the Committee: Stéphane Sarkany

The Comparative Literature Committee offers programs of graduate study leading to the degree of Master of Arts. These programs, involving courses in comparative literature and, where appropriate, up to two courses from other departments, have considerable flexibility in the sense that they can be tailored to suit each student's special interests in particular periods or areas while, at the same time, through the core course Comparative Literature 17.500 and the final comprehensive, providing a specialized training in the techniques of comparative literature.

The purpose of the comparative literature program is to study literature in its international context, and to relate and compare literary phenomena usually studied in isolation because of linguistic barriers and the traditional departmental division of academic disciplines. Thus, taking into account the interrelation of all humanistic studies, such as the various literatures, philosophy, psychology, sociology, the visual arts, and history, "comparatists" view literary creation within the total complex evolution of world literature. The historical flow of literary archetypes, the role of folklore and myth in literature, recurrent problems of literary theory, and consideration of the less well known literatures of the world are some of the objects of comparative literature studies.

The study of this discipline must be based on a truly comparative perspective, on a solid linguistic foundation, and on an awareness of all difficulties that arise in comparative literature, conceived as a domain both within and beyond the limits of national literatures.

Students registered in other language departments, who wish to register in one or more courses from the comparative literature program, must demonstrate a reading knowledge of the languages required for each course. Three years of study at the university level will normally constitute the required level of language proficiency.

Qualifying-Year Program

Applicants who hold only a general (pass) B.A. degree will be required to complete successfully the basic course Comparative Literature 17.400: Foundations of Comparative Literature, and to take courses from other departments of literature, or comparative literature (see undergraduate calendar) to achieve the equivalent of a combined honours B.A. with high second-class standing.

The total course program is to be worked out in consultation with the graduate studies supervisor. Formal admission to the master's program may be considered at the end of the first term.

Master of Arts

Admission Requirements

The regulations governing admission to the master's program are outlined in the general section of this calendar.

The specific requirements for admission to the master's program in comparative literature are the following:

- An honours B.A. degree (or the equivalent) with at least high second-class standing, including two full courses in literature at the senior undergraduate level in each of the two language fields (studied in the original language). Candidates who hold degrees in only one national literature, or in the humanities or social sciences, will be required to take additional courses or to register in the qualifying-year program.
- In addition to proficiency in English, students should have a comprehensive knowledge of either French or German (including the ability to read primary and secondary sources in that language, and to participate occasionally in class discussions in that language).
- A reading knowledge of at least one additional language from among the following: French, German, Spanish, Italian, Russian, Latin, or classical Greek; in special cases, the committee may permit the substitution of some other language. Students accepted into the program who

lack this reading knowledge will be required to demonstrate that they have reached the appropriate level before completing the program and receiving the M.A.

Program Requirements

Students accepted into the master's program without having taken Comparative Literature 17.400 (or its equivalent) will be required to take this course as extra to the degree.

The program requirements for master's candidates in comparative literature are the following:

- Comparative Literature 17.500: Methods of Analysis in Literary Studies
- *One of the following two combinations:*

Three graduate courses selected from those offered by comparative literature and other departments; (one 400-level course may be substituted for a graduate course) *or*

Comparative Literature 17.599: M.A. Thesis, plus one graduate course

- Comparative Literature 17.593: Comprehensives in Comparative Literature (written and oral).

Course Patterns

Certain course patterns based on offerings by comparative literature and other departments have been drawn up for 1983-84. Students may choose their course options from:

Theories and Techniques of Analysis (Co-ordinator: Stéphane Sarkany)
17.520 (Comparative Literature) Intertextuality: Literature and Other Cultural Phenomena — La Censure
18.553 (English) A Materialist Approach to the Classic Nineteenth-Century English Novel
22.542 (German) The Emblematic Tradition in the Seventeenth Century
22.565 (German) Rhetorik in Mittelalterlicher Dichtung und Rede
38.570 (Spanish) The Concept of Irony in Twentieth-Century Spanish-American Literature

Semiotics (Co-ordinator: R.M. Polzin)
17.507 (Comparative Literature) Study of a Theme or Motif: The Double as Theme and as Form
17.510 (Comparative Literature) Le Roman moderne: systèmes de signification
18.400 (English) Structuralism and the Theory of English Literature

Myth and Archetype (Co-ordinator: F.G. Loriggio)
Not Offered in 1983-84

Social, Cultural, and Political Function of Literature (Co-ordinator: Stéphane Sarkany)
17.520 (Comparative Literature) Intertextuality: Literature and Other Cultural Phenomena — La Censure
17.530 (Comparative Literature) Seminar in Comparative Literature: The Novel of the Spanish Civil War
18.553 (English) A Materialist Approach to the Classic Nineteenth-Century English Novel
27.411 (Mass Communication) Public Power Policy
38.570 (Spanish) The Development of Literary Blackness in Spanish America
47.531 (Political Science) Modern Political Culture and Ideology
53.500 (Sociology) Marx and the Marxists
53.530 (Sociology) Sociology of Culture

The Third World: Selected Areas (Co-ordinator: V.K. Chari)
32.576 (Philosophy) Ethical and Cultural Dimensions in Development Studies
38.560 (Spanish) The Spanish-American Novel since 1947
38.570 (Spanish) The Development of Literary Blackness in Spanish America
38.570 (Spanish) The Concept of Irony in Twentieth-Century Spanish-American Literature

Literatures of Small Language Areas (Co-ordinator: Stéphane Sarkany)
Not Offered in 1983-84

Literature of the Americas (Co-ordinator: J.B. Dallett)
38.560 (Spanish) The Spanish-American Novel since 1947

38.570 (Spanish) The Development of Literary Blackness in Spanish America
38.570 (Spanish) The Concept of Irony in Twentieth-Century Spanish-American Literature

Canadian Literature in Multicultural Context
(Co-ordinator: Massimo Ciavolella)
17.590 (Comparative Literature) Seminar in Comparative Literature: The Folktale in Canada — Introduction to the Study of the Folktale
11.507 (Art History) Selected Aspects of Prehistoric and Contemporary Inuit Art
20.571 (French) La Femme et l'écriture du Québec
24.531 (History) French Canada since Confederation
24.538 (History) The Indian Peoples of Eastern British North-America (1763-1867)
18.581 (English) Canadian Poetry

Medieval (Co-ordinator: Massimo Ciavolella)
22.565 (German) Rhetorik in Mittelalterlicher Dichtung und Rede
26.400 (Italian) Dante: An Intensive Study
38.515 (Spanish) Metrics, Grammar, and Literary Textual Criticism of the *Libro de Alexandre*

Renaissance and Baroque (Co-ordinator: C.A. Marsden)
17.534 (Comparative Literature) Study in Literary Genres: Renaissance Drama
20.551 (French) La Conception de l'amour dans la littérature de la Renaissance en France
38.520 (Spanish) A Close Textual Reading of Góngora

Enlightenment, Romanticism and Realism
(Co-ordinator: F.G. Loriggio)
Not Offered in 1983-84

Modern Literature: Poetry
(Co-ordinator: Pierre Laurette)
18.581 (English) Canadian Poetry
22.562 (German) Literaturtheorie in Zusammenhang mit der Lyrik
22.574 (German) Individual Authors: The Early Goethe

Modern Literature: Drama
(Co-ordinator: Angel López-Fernández)
17.534 (Comparative Literature) Study in Literary Genres: Renaissance Drama
22.550 (German) Myth in Drama
36.445 (Russian) Modern Drama

Modern Literature: Prose (Co-ordinator: Stéphane Sarkany)
17.506 (Comparative Literature) Women and Fiction: The Period Between the World Wars
17.510 (Comparative Literature) Le Roman moderne: systèmes de signification
18.553 (English) A Materialist Approach to the Classic Nineteenth-Century English Novel
20.551 (French) Gide et l'art de la fiction
38.560 (Spanish) The Spanish-American Novel since 1947

In all cases, the committee will prescribe a program of studies that will complement the student's background and special interest.

Graduate Courses*

A prerequisite for all graduate-level courses is appropriate linguistic ability and approval of the Comparative Literature Committee.

- Comparative Literature 17.400
Foundations of Comparative Literature
In the first part of the course, the history of the discipline of comparative literature will be studied, including its beginnings in nineteenth-century France, its evolution, and its current status in Europe, the United Kingdom, the United States, and Canada. The second part of the course will focus on twentieth-century literary theories in the context of comparative studies, providing the student with an overall view of the theoretical discussion of literature from about 1920 to the

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present. Included in the study will be Russian Formalism, American New Criticism, and such other approaches as the structuralist, semiotic, sociocultural, and hermeneutic.
Prerequisite: Permission of the committee.
Stéphane Sarkany and F.G. Loriggio.

• Comparative Literature 17.500T2, S2
Methods of Analysis in Literary Studies
The first part of the course deals with linguistic fundamentals of descriptive analysis as practised in the content of comparative literary studies. Emphasis will be put on the structural interdependence of the various layers of analysis: for example, morpho-phonemic, syntactico-semantic, etc., with practical work on poetry and short prose fiction. In the second part of the course, classical and modernist theories of narrative structure and of world construction will be tested in discussions bearing on some of the works of Gide and Huxley; such discussions will be conducted in the language in which the respective texts were written: French, in the case of Gide, English, in that of Huxley.
Prerequisite: Permission of the committee.
H.-G. Ruprecht and A.W. Halsall.

• Comparative Literature 17.505W1
Translation Workshop
This course will deal with theoretical as well as practical aspects of translation of poetry. Texts of modern English and French Canadians, and of English, American, and German poets will be studied.
Prerequisite: Permission of the committee.
Evelyne Voldeng.

• Comparative Literature 17.506T2
Styles and Periods
Topic for 1983-84: Women and Fiction—The Period Between the World Wars
This course will focus on the novels and short stories of some prominent women authors of the twenties and thirties. In selected works by Canadian, Scandinavian, English, French, and American authors, such as Sigrid Undset, Karen Blixen (alias Isak Dinesen), Lucy Montgomery, Martha Ostenso, Colette, Virginia Woolf, Gertrude Stein, etc., those features — formal and sociocultural — which characterize the fiction written by women authors will be identified and defined. Particular attention will be given to the presentation of the female characters and their interrelationships. Also, the role assigned to women in the structure of the narrative and the position of the women vis-à-vis the rest of the narrative personnel will be examined. (Reference will be made to the rising women's rights movements in the above countries.)
Prerequisite: Permission of the committee.
G.A. Woods.

• Comparative Literature 17.507T2
Study of a Theme or Motif
Topic for 1983-84: The Double as Theme and as Form
The course will focus on representation of the double (theme of the twins, narcissism, split personalities, etc.) and on forms of formal doubleness (the play within the play, versions of "mise en abîme", etc.). As objects of study, comedy and the novel will be privileged, but some films will also be discussed. The list of authors to be studied includes Plautus, Bibbiena, Shakespeare, Hoffman, Poe, Dostoevsky, Conrad, Gide, Huxley, Pirandello, Nabokov, Robbe-Grillet.
Prerequisite: Permission of the committee.
F.G. Loriggio.

• Comparative Literature 17.510T2
Special Topic in Modern Fiction
Topic for 1983-84: Le Roman moderne: systèmes de signification
Études sémiotiques des conditions de production, des procédés d'organisation textuelle et des modes de réception sur la base d'un choix limité d'œuvres romanesques françaises, québécoises, latino-américaines, anglaises et allemandes.
Prerequisite: Proficiency in French in addition to a good knowledge of either English, Spanish, or German. Permission of the committee.
H.-G. Ruprecht.

• Comparative Literature 17.520T2
Intertextuality: Literature and Other Cultural Phenomena
Topic for 1983-84: La Censure
Fonctionnement publique et secret de la censure au 20ème siècle aux plans légal, économique, idéologique et psychologique. De la censure du théâtre et du livre au début du siècle jusqu'à l'autocensure d'aujourd'hui.
Prerequisite: Permission of the committee.
Stéphane Sarkany.

• Comparative Literature 17.530W1
Seminar in Comparative Literature
Topic for 1983-84: The Novel of the Spanish Civil War
A study of the principal novels which have focused on the Spanish Civil War, from *Requiem por un campesino espanol* (1950) by Sender to *Autobiografía de Federico Sánchez* (1979) by Semprún.
Prerequisite: Proficiency in Spanish; permission of the committee.
Angel López-Fernández.

• Comparative Literature 17.534W1
Study in Literary Genres
Topic for 1983-84: Renaissance Drama
A study of selected Renaissance comedy plays.
Prerequisite: Permission of the committee.
D.A. Beecher.

• Comparative Literature 17.590T2
Seminar in Comparative Literature
Topic for 1983-84: The Folktale in Canada—Introduction to the Study of the Folktale
Problems of collecting and archiving oral literature. Classification of folktales: for example, fairy tales, magic tales, jokes; folktale types, motifs, functions, motifemes, etc. Aesthetics of the folktale. Folktale and literature. Functions of the folktale: for example, ritual, ideological. Theoretical study of the folktale: historical-geographic school (A. Aarne and S. Thompson), morphology (V. Propp and A. Dundes), structural analysis of folktales and myths (Lévi-Strauss and others), performance school (Dan Ben Amos and others), etc. As an illustration of this theoretical study, should time and conditions permit, students may be asked to collect and analyze a few Canadian folktales.
Prerequisite: Proficiency in English or French; permission of the committee.
André Elbaz.

• Comparative Literature 17.593F2, W2, S2
Comprehensives

• Comparative Literature 17.596T2
Directed Special Studies
From time to time, students whose main interests are not covered by courses offered in a given year may pursue independent research, subject to the availability of a qualified adviser and relevant library resources at Carleton. Interested students should apply to the supervisor of graduate studies.

• Comparative Literature 17.598F1, W1, S1
Directed Special Studies
From time to time, students whose main interests are not covered by courses offered in a given year may pursue independent research, subject to the availability of a qualified adviser and relevant library resources at Carleton. Interested students should apply directly to the supervisor of graduate studies.

• Comparative Literature 17.599F4, W4, S4
M.A. Thesis

Courses Not Offered in 1983-84

17.525 Literary Movements in the Nineteenth and Twentieth Centuries
17.530 Literary Archetypes
17.561 Study in Literary Genres
17.591 Seminar in Comparative Literature

Department of English Language and Literature

The Department

Chairman of the Department: Douglas Wurtele
Departmental Supervisor of Graduate Studies: R.D. Mathews

The Department of English offers programs of study leading to the M.A. and Ph.D. degrees in English Language and Literature. Additional information may be obtained by consulting the departmental supervisor of graduate studies.

Qualifying-Year Program

Applicants who hold a general (pass) B.A. degree with at least B standing, with a major in English language and literature, may be admitted to the qualifying-year program. Normally, these students will be required to complete four or five full courses (or the equivalent) in English, as determined by the department, and to maintain at least high second-class standing before being considered for admission into the master's program.

Master of Arts

Admission Requirements

The minimum admission requirement for the master's program is an honours B.A. (or the equivalent) in English Language and Literature, with at least high second-class standing, and including at least five of the following areas:

- History of the English Language or General English Linguistics
- Old English or Middle English
- Renaissance Literature
- Drama (including Shakespeare)
- Restoration and Eighteenth-Century Literature
- Romantic and Nineteenth-Century Literature
- Twentieth-Century Literature
- Canadian Literature

Possession of the minimum entrance standing is not in itself, however, an assurance of admission into the program.

Program Requirements

Each candidate will select one of the following optional program patterns:

- Three full courses (or the equivalent) in English, including English 18.597: Special Topic Studies, selected from those offered at the 500 level (except English 18.598), and a master's thesis; an oral examination on the thesis and related fields will also be undertaken.
- Five full courses (or the equivalent) in English, including English 18.598: Directed Special Studies, selected from those offered at the 500 level (except English 18.597).

Under certain conditions, one of the optional courses in either program pattern may be selected from those offered by the department at the senior undergraduate level in a field for which no graduate course is available. One of the optional courses may also be a cognate course at the graduate or the senior undergraduate level, offered by another department; however, not more than one undergraduate course may be included in the total program.

All candidates are required to demonstrate a reading knowledge of one language other than English, approved by the department.

Academic Standing

A standing of B- or better must be obtained in each course counted towards the master's degree.

Doctor of Philosophy

A Ph.D. program specializing in Canadian literature has been offered since 1979-80. It requires three years of full-time study, with the residence requirement satisfied at the end of the second year.

Admission Requirements

A master's degree in English language and literature, with high second-class standing or better, will be required for admission. A solid background in the English literary tradition will be assumed, but in particular, applicants should show evidence of competence in certain periods or fields. These should include Canadian Literature (a minimum of one course at the graduate level) and four of

the following: Eighteenth Century; Romantic; Victorian; Nineteenth-Century American; Nineteenth- or Twentieth-Century French; Twentieth-Century British and American; History of Criticism; the Literatures of the Commonwealth.

Program Requirements

French Language

A thorough knowledge of French, including both reading and aural comprehension, will be required of all applicants. A test consisting of a one-hour oral examination on selected passages of French-Canadian prose and poetry will be administered soon after the student is formally admitted to the program, and the candidate will at the same time be required to produce a written translation of selected passages of French-language literary criticism.

Courses

The doctoral program requires two years of course work, a total of five credits earned in five compulsory courses at the 600 level. Candidates will normally take three courses in the first year: English 18.681, English 18.683, and English 18.687; in the second year they will take English 18.680 and English 18.688. In special circumstances, with the approval of the graduate studies committee, a candidate may replace one course with a course in another department at either the 500 or 600 level.

Comprehensive Examination

On the completion of the course work, each candidate will be examined comprehensively, in two written papers of three hours each, in the field of Canadian literature and its contexts. An oral examination, two hours in length, will probe the written papers and assess the candidate in an area of concentration within the field of Canadian literature.

The area of concentration may be related to, but will not be identical with, the candidate's thesis topic. Three months before the date of the comprehensive examination, the candidate will submit to the supervisor of graduate studies, for departmental approval, a proposal for his/her area of concentration. The submission will include a bibliography of sources considered relevant to the area.

Thesis

Each candidate will submit a thesis and defend it in an oral examination; procedures outlined by the Faculty of Graduate Studies and Research will apply. The candidate's third year will normally be reserved for the researching and writing of the thesis; completed, this work will have the weight of five full credits.

Graduate Courses*

- English 18.500T2
Literary Criticism
A study of specific topics or particular areas of literary criticism.

- English 18.534S1
Renaissance Drama
A study of selected plays by William Shakespeare.

- English 18.534W1
Renaissance Drama
A study of selected Renaissance comedy plays.

- English 18.548T2
Studies in Romanticism
A study of nature and spirit in Romantic literature.

- English 18.553T2
Nineteenth-Century Fiction
A study of selected fiction writers of the nineteenth century.

- English 18.561T2
Twentieth-Century Poetry
A study of selected poets of the twentieth century.

- English 18.566F1
Twentieth-Century Literature
A study of selected twentieth-century authors.

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

• English 18.568W1
Twentieth-Century Studies
A study of a selected theme or topic in twentieth-century British fiction.

• English 18.576T2
American Literature
A study of selected American writers.

• English 18.581S1
Canadian Poetry
A study of selected Canadian poets.

• English 18.583T2
Canadian Fiction
A study of selected Canadian writers.

• English 18.585W1
Canadian English
A study of the English language and its varieties in Canada.

• English 18.590S1
Selected Topic
A study of the child in literature.

• English 18.597T2, S2
Special Topic Studies
All thesis students will be assigned to an adviser (normally their thesis supervisor) for special tutorials in the general area of their thesis research.

• English 18.598T2, S2
Directed Special Studies
All students in the M.A. course program will be assigned to an adviser who will direct their area of special studies, preparing them for an oral examination in that area.

• English 18.599F4, W4, S4
M.A. Thesis

• English 18.681T2
Studies in Canadian Literature I (Poetry)
Selected authors in Canadian poetry and drama written both before and after World War I, and in both English and French, will be studied in depth.

• English 18.683T2
Studies in Canadian Literature II (Fiction)
Selected authors in Canadian fiction and other prose written both before and after World War I, and in both English and French, will be studied in depth.

• English 18.687T2
Studies in Scholarship
Bibliography, editing, and research, as these relate to Canadian literature. Maximum use will be made of manuscripts and other primary documents.

• English 18.699F10, W10, S10
Ph.D. Thesis

Undergraduate Courses

Graduate students may take *one* of their courses at the senior undergraduate level.

Other Disciplines

Graduate students may take *one* of their five courses in a related discipline. The following courses may be of special interest:

Comparative Literature
17.400 Foundations of Comparative Literature
17.500 Methods of Analysis in Literary Studies
17.506 Styles and Periods: Women and Fiction — The Period Between the World Wars
17.507 Study of a Theme or Motif: The Double as Theme and as Form
17.590 Seminar in Comparative Literature: The Novel of the Spanish Civil War

Other Universities

Graduate students may take up to *two* of their five courses at another university or other universities and receive credit towards a Carleton M.A. Students are especially reminded that the University of Ottawa offers a wide range of graduate courses which may be completed (under the general two-course ruling) for credit at Carleton.

Courses Not Offered in 1983-84

18.518 Old Norse
18.521 Middle-English Poetry
18.522 Middle English
18.527 Selected Medieval Authors
18.528 Middle-English Studies
18.531 Renaissance Poetry
18.532 Seventeenth-Century Poetry
18.537 Renaissance Authors
18.538 Renaissance Studies
18.542 Eighteenth-Century Prose and Poetry
18.543 The Eighteenth-Century Novel
18.551 Nineteenth-Century Poetry
18.558 Nineteenth-Century Literature
18.563 Twentieth-Century Fiction
18.564 Twentieth-Century Drama
18.567 Twentieth-Century Authors
18.571 American Poetry
18.573 American Fiction
18.578 Studies in American Fiction
18.587 Selected Topic in Canadian Literature
18.588 Studies in Canadian Literature
18.594 Special Studies in Dramatic Literature
18.680 Literary Criticism in Canada
18.688 Comparative and Contextual Studies

The Department

Chairman of the Department: C.G. Faulkner

The department does not offer a program of studies at the graduate level, but does offer a course at the graduate level, under the aegis of the Institute of Canadian Studies.

Graduate Courses*

• Film Studies 19.528T2
Canadian Cinema
Through a close analysis of films from both cultures, this course should establish the distinctly Canadian modes our cinema has developed. Special attention will be paid to the similarities and differences between English Canada and Québec, relating them both to the economic and political realities of our country, and to the variety of thematic orderings of Canadian culture that can be found now in the writings of Northrop Frye, Margaret Atwood, Ronald Sutherland, Robin Mathews, John Moss, and others.

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

Department of French

The Department

Chairman of the Department: Sinclair Robinson
Departmental Supervisor of Graduate Studies: Jean Miquet

The program of studies leading to a Master of Arts degree in French is divided into three sectors: literary history, literary criticism, and the linguistic analysis of literary discourse. The program should be treated as an open system allowing for an exchange among these three closely interrelated fields of study and methodological approaches.

Qualifying-Year Program

Applicants who hold a general (pass) bachelor's degree with at least B standing or higher, with a major in French, will be required to register in the qualifying-year program (normally five courses in French chosen from those numbered at the 400 level), and maintain at least B- standing in each of these courses, before proceeding to the M.A. program.

Master of Arts

Admission Requirements

The normal requirement for admission into the master's program is an honours B.A. in French with at least high second-class standing (normally B+ or better in honours subject; B- or better overall).

Program Requirements

The following two patterns are available to candidates:

- Four full courses (or the equivalent) of which at least three must be chosen from those numbered at the 500 level; and a directed special studies option (20.590) with an oral examination
- Three full courses (or the equivalent) of which at least two must be at the 500 level; and a master's thesis equivalent to two full courses. An oral examination on the thesis and related fields will also be undertaken.

Candidates who choose to write a thesis may not take the directed special studies option (20.590).

The student will normally choose either literary history or literary criticism as the central area of study, and will earn at least three credits in this sector. The remaining two courses may be taken either from the other major sector (literary history or literary criticism), or one may be chosen from the other major sector (literary history or literary criticism), and one from the third sector (linguistic analysis of literary discourse).

Students will choose at least one course with French content and at least one course with French-Canadian content.

With the approval of the department, master's students in French may select a comparative literature course in partial fulfilment of their program requirements.

Academic Standing

A grade of at least B- must be obtained in each course counted for credit towards the master's degree.

Selection of Courses

Qualifying-year students should consult the undergraduate calendar for a listing of 400-level courses. With the approval of the department, these courses are also open to students in the M.A. program.

One course at the 400 or 500 level is normally offered in the spring or summer session each year.

Graduate Courses*

The graduate courses offered by the department are open to students in the M.A. program and, with permission of the department, to students in the qualifying-year program. For prerequisites, please consult the department.

- French 20.511T2
La conception de l'amour, dans la littérature de la Renaissance en France
Le cours comportera l'étude détaillée d'un certain nombre de textes illustrant les grands courants néo-platonicien et pétrarquiste ainsi que la survivance de l'esprit 'gaulois'. Parmi les œuvres étudiées: *L'Heptaméron* de Marguerite de Navarre, *La Parfaite Amie* d'Antoine Héroet, *Les Sonnets pour Hélène* de Ronsard. Examen des idées, analyses stylistiques.
H.P. Clive.

- French 20.521T2
Voltaire: Poète et critique, dramaturge, historien, polémiste
L'étude de l'évolution de la philosophie de Voltaire en même temps que l'analyse du style qui sera le véhicule de ces idées. L'examen du bel esprit qui devient patriarche en passant par l'homme de science et le courtisan. Tentative de situer l'homme et l'écrivain dans son siècle aussi bien que d'attacher l'époque au philosophe: ses rapports avec les gens autour de lui, émules et disciples.
C.P. Fleischauer.

- French 20.551T2
Gide et l'art de la fiction
Analyse des techniques fictives de Gide pour révéler les aspects poétiques et rhétoriques des quatre sous-genres-narratifs qu'il a pratiqués: la fiction symboliste, les récits, les soties, le roman. Techniques à traiter: le monologue intérieur, le style indirect libre, l'emploi ironique du journal intime, le fonctionnement des personnages porte-parole, la mise en abîme, etc.
A.W. Halsall.

- French 20.571T2
La femme et l'écriture au Québec
Ce cours analysera la place de la femme dans les idéologies dominantes du Québec et l'émergence d'une parole féminine en littérature à partir de la fin du dix-neuvième siècle. Les œuvres d'imagination aussi bien que les écrits non-fictifs (mémoires, journaux intimes, écrits journalistiques) des femmes-écrivains seront étudiées à la lumière des théories psychanalytiques et sociales de la femme et l'écriture.

- French 20.590T2,S2
Études dirigées
Tout étudiant qui ne fait pas de thèse, choisira un directeur d'études avec qui il/elle préparera un mémoire d'une cinquantaine de pages sur un sujet de son choix. Ce travail sera sanctionné par un examen oral.

- French 20.591F1, W1, S1
Préparation à l'examen général
Réservé aux étudiants inscrits au programme de maîtrise avant l'année scolaire 1981-82.

- French 20.599F4, W4, S4
M.A. Thesis

Courses Not Offered in 1983-84

20.501 Linguistique théorique ou linguistique et discours littéraire
20.531 Genres
20.541 Sémiotique, poétique, rhétorique
20.561 Mythocritique, psychocritique

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

Department of German

The Department

Chairman of the Department: Jutta Goheen
Departmental Supervisor of Graduate Studies: Robert Gould

The Department of German offers programs of study leading to the degree of Master of Arts. These include courses on all major periods in German literature, genres, themes, and a number of individual authors, as well as on aspects of literary theory and the study of the German language. The Age of Goethe figures prominently in the teaching and research of the department, which offers a favourable setting for specialized studies in this period.

Admission Requirements

Departmental requirements conform to those outlined for master's students in the general section of this calendar. Further information concerning graduate work in German may be obtained from the department.

Program Requirements

Master's students in German normally will be required to select and follow one of the following optional program patterns:

- Three full courses (or the equivalent) and a thesis
- Four full courses (or the equivalent) and a research essay
- Five full courses, or the equivalent.

While these courses will normally be courses offered by the department, permission, where appropriate, may be granted for enrolment in one course from the program of the Comparative Literature Committee.

German 22.590 is an obligatory course for all graduate students (full-course credit).

All master's students are also required to undertake a comprehensive examination, based on a departmental reading list.

Selection of Courses

The following senior undergraduate courses are open to students in the qualifying-year program:

German
22.401 Formal German Speech
22.442 German Literature of the Seventeenth Century
22.451 Goethe I
22.471 Romantic Prose
22.480 German Drama on the Threshold of the Twentieth Century

For 400-level courses not offered in 1983-84, see the undergraduate calendar.

Graduate Courses*

- German 22.542W1
Genres in German Literature
The emblematic tradition and its relevance for German letters in the seventeenth century.
Joseph Dallett.

- German 22.550T2
Prevalent Themes in German Literature
Myth in drama.
E.M. Oppenheimer.

- German 22.562W1
Period Studies
Literaturtheorie im Zusammenhang mit der Lyrik des 20. Jahrhunderts.
Angelika Manyoni.

- German 22.565F1
Period Studies
Rhetorik in mittelalterlicher Dichtung und Rede — Gotfrids von Strassburg "Tristan und Isolde", Berthold von Regensburg, Predigten.
Jutta Goheen.

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

• German 22.574F1
Individual Authors
The early Goethe.
Robert Gould.

• German 22.590T2
Directed Studies
An obligatory course of supervised study in preparation for the comprehensive examination.

• German 22.591F1, W1, S1
Special Topic
Tutorial.

• German 22.598F2, W2, S2
Research Essay

• German 22.599F4, W4, S4
M.A. Thesis

Courses Not Offered in 1983-84

Genres in German Literature
22.541 Struktur des modernen Romans
22.543 Novelle des 19. Jahrhunderts
22.544 The German Idyll from Gessner to Mörike
22.547 Radical poetics
22.548 Deutsche Erzählprosa zwischen Reformation und Aufklärung
22.549 Satire, fantasy, and the poetics of scale: Kafka, Musil, (Robert Walser, Kunert)

Period Studies
22.560 Dichter und Tradition in mittelalterlicher Lyrik
22.567 Romantic poetry: Novalis, Tieck, Eichendorff, Brentano, and others
22.568 The convergence of lyrical and dramatic elements in works by Hauptmann, Hofmannsthal, Rilke, George, and selected Expressionists
22.569 Naturlyrik der Aufklärung

Individual Authors
22.572 Heinrich von Kleist
22.573 R.M. Rilke
22.576 Grimmelshausens *Simplicissimus*
22.577 *Faust* II

Linguistic Problems
22.581 Applied linguistics: pedagogic grammar of German
22.582 Mittelalterliches Deutsch
22.583 Sprachwandel im Neuhochdeutschen

Department of History

The Department

Chairman of the Department: R.C. Elwood
Departmental Supervisor of Graduate Studies: P.J. King
Associate Supervisor: J.K. Johnson

The Department of History offers programs of study leading to the degree of Master of Arts in Canadian, American, British, Modern French, Modern Russian, International (diplomatic), and Medieval History. It also offers a program of study and research leading to the degree of Doctor of Philosophy in Canadian History.

Master of Arts

Admission Requirements

The minimum requirement for admission to the master's program is an honours bachelor's degree (or the equivalent) with at least high second-class standing.

The department offers no qualifying-year program; applicants with a general (pass) degree may be considered for admission into the fourth year of Carleton's honours B.A. program.

Program Requirements

Candidates may follow either a thesis or a non-thesis program, as follows:

- History 24.588 or 24.589:
a seminar or tutorial in the historiography of the appropriate country or area (one credit)

- History 24.500:
a practicum in the applied uses of history (one credit)
- a graduate history seminar in the student's major field of concentration (one credit)

- *Either* History 24.599:
thesis (two credits); *or*

- History 24.598:
research essay (one credit) *plus* one additional seminar (one credit), which may be chosen from those offered at the graduate or 400 level by the Department of History, by another department at Carleton University, or by the Department of History at the University of Ottawa.

Language Requirements

All candidates are required to demonstrate a reading knowledge of a language other than English, the choice to depend upon the field of the candidate's thesis or research. For seminars dealing with sources not in English, a reading knowledge of the appropriate language will be required *before* registration. Details may be obtained from the supervisor of graduate studies.

Doctor of Philosophy

Admission Requirements

Applicants with an M.A. degree will be expected to have at least high second-class standing.

An applicant with an honours bachelor's degree who has achieved an outstanding academic record and, in addition, exhibits very strong motivation and high promise for advanced research, may be admitted to the Ph.D. program directly. Such candidates will be required to complete at least 15 full courses, or the equivalent.

Residence Requirements

- A minimum of three years of full-time study after the B.A. honours degree, or two years after the M.A.

Program Requirements

Candidates will be responsible for three fields: a major field in Canadian history, and two minor fields. The latter are usually chosen from among American history, British history, or an aspect of European history; one of these may be a transnational topic, or in a related discipline. Each of the three fields covers approximately one century. Written examinations will be taken in the two minor fields after two terms of study; an oral examination concentrating on the major field will be arranged after three terms.

A reading knowledge of French will be required. The language examination will be written early in the first post-M.A. year, and before the candidate is permitted to take the doctoral

fields examination. Proven competence in an additional language may be required if it is pertinent to the candidate's program.

Students entering the program with an honours B.A. will normally complete

- History 24.588: Historiography of Canada
- History 24.591: Directed Studies in a Canadian Field
- History 24.592: Directed Studies in a Non-Canadian Field
- and two other graduate seminars in their first year.

Students entering the second year (that is, the first post-M.A. year) will normally be required to follow

- History 24.688: Social History
- History 24.690: Preparation for a Ph.D. oral examination in Canadian history (equivalent to two full credits)
- Two of

History 24.610: Directed Studies in an Aspect of Modern European History; History 24.640: Directed Studies in United States History; History 24.650: Directed Studies in British History; an approved course of studies in a related discipline appropriate to the candidate's field. Candidates may take an appropriate 500-level seminar.

With other requirements completed, doctoral students will be required to write a thesis on a topic related to Canadian history (five credits).

University of Ottawa

A Carleton University student may take one seminar in the Department of History at the University of Ottawa, with permission of the two departments. The following graduate seminars are available in various years:

5300 Directed Studies in Canadian History
5400 Directed Studies in Canadian History
5402 New France: Problems in the Interpretation of Colonial History
5405 The History of the Left in Canada, 1867-1960
5406 The Union of the Canadas, 1839-1867
5414 Lower Canada 1760-1840
5700 Études dirigées en Histoire du Canada
5702 Textes relatifs à l'Histoire sociale de la Nouvelle-France
5705 Rapports intellectuels du Canada français avec l'extérieur au XIX[e] siècle
5800 Études dirigées en Histoire du Canada
5802 Problèmes en Histoire sociale de la Nouvelle-France
5807 Études dirigées en Histoire du Québec
5814 Le Bas-Canada, 1760-1840
6302 Seminar on United States Foreign Relations in the Nineteenth and Twentieth Centuries
6303 Seminar in American History
6403 Seminar in American History
7300 Directed Studies in European History
7390 Problems in European Diplomatic History, 1815-1914
7400 Directed Studies in European History
7412 Seminar in Economic History of Colonial America
7691 La transition de l'ère pré-industrielle à l'ère industrielle, en Europe, aux XVIII[e], XIX[e] siècles. Économies et sociétés
7700 Études dirigées en Histoire européenne
7704 Séminaire en Histoire sociale
7800 Études dirigées en Histoire européenne
7891 Histoire des organisations internationales en fonction des idéologies du monde contemporain

Graduate Courses*

Most, but not all of the graduate seminars (History 24.500 through 24.588 and 24.688) are offered each year, but none is available during the summer. The directed studies and thesis courses (History 24.589 through 24.690) are always offered during the academic year, and are frequently available during the spring and summer terms as well.

- History 24.500T2

Practicum in Applied History

Study of the practical uses of history in such fields as archival management, museum research, oral

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history, journal editing, quantitative investigations, and contract research.
D.A. Muise and members of the department.

• History 24.505T2
Law and Society in Medieval England
J.G. Bellamy.

• History 24.516T2
The French Revolution, 1788-1804
A sound reading knowledge of French is required for admission.
M.J. Sydenham.

• History 24.531T2
French Canada since Confederation
A study of topics relating to the political and social history of French Canada and to problems of cultural duality.
H.B. Neatby

• History 24.532T2
Studies in the Economic and Social History of Ontario in the Nineteenth Century
J.K. Johnson.

• History 24.534T2
Problems of Growth and War in Canada, 1896-1921
M.J. Barber and R.T. Clippingdale.

• History 24.535T2
Canada in the North Atlantic World, 1900-1949
An examination of Canada's changing relationships with Great Britain and the United States.
D.M.L. Farr.

• History 24.536T2
Science and Technology in the Canadian Experience
An examination of the role and relationship of science and technology, including their social and engineering applications, in the Canadian historical experience.
J.H. Taylor.

• History 24.537T2
The Maritimes in Transition, 1840's to 1890's
A seminar on social and economic themes. Quantitative approaches and comparative themes with Central and Western Canada will be encouraged.
D.A. Muise.

• History 24.538T2
The Indian Peoples of Eastern British North America, 1763-1867
S.F. Wise.

• History 24.539T2
Acadian Society, 1604-1967
N.E.S. Griffiths.

• History 24.540T2
The Age of the American Revolution, 1730-1815
P.J. King.

• History 24.557T2
Community in Early Modern England, 1450-1600
R.B. Goheen.

• History 24.558T2
Reform and Society in Mid-Nineteenth-Century Britain
J.N. Cooper.

• History 24.560T2
Revolutionary Russia, 1898-1921
An examination of various primary sources available for research on revolutionary Russia. A sound reading knowledge of Russian is required for admission.
R.C. Elwood.

• History 24.570T2
British Imperial History
Research will normally be done on a British North American or Canadian subject, considered in an imperial context between the late eighteenth and early twentieth centuries.
G.P. Browne.

• History 24.580T2
Problems in International History: Polarization and Cold War, 1917-1950
J.L. Black.

• History 24.588T2
Historiography of Canada
A seminar, primarily for graduate students in Canadian history, which examines the trends and methods of Canadian historical writing, and the influences upon it.
S.R. Mealing.

• History 24.589T2, S2
Historiography
A course of directed studies in one of the following fields:

Modern France
The intensive study of selected problems in the writing of modern French political and social history.
M.J. Sydenham.

Britain
The intensive study of a range of selected problems in the writing of sixteenth-century *or* nineteenth-century English history.
R.B. Goheen or J.N. Cooper.

Modern Russia
Concentrated reading in Russian intellectual history and supervised study of Russian historiography, with emphasis on the nineteenth and early twentieth centuries.
R.C. Elwood and J.W. Strong.

United States
A course in which the trends and methods of historical writing on the United States will be examined.
P.J. King.

International History
A course in which the trends and methods of historical writing on international history will be examined.
J.L. Black and R.A. Jones.

Medieval History
Historical method and historiography of an aspect of the Middle Ages.
J.G. Bellamy.

• History 24.591T2, S2
Directed Studies in a Canadian Field
A program of supervised reading and preparation of written work in an area not covered by an existing graduate seminar.

• History 24.592T2, S2
Directed Studies in a Non-Canadian Field
(same description as 24.591)

• History 24.593F1, W1, S1
Directed Studies in a Canadian Field
(same description as 24.591)

• History 24.594F1, W1, S1
Directed Studies in a Non-Canadian Field
(same description as 24.591)

• History 24.598F2, W2, S2
M.A. Research Essay
An examination of an approved topic in Canadian, American, British, modern French, modern Russian, international, or medieval history.

• History 24.599F4, W4, S4
M.A. Thesis
A substantial historical investigation. The subject will be determined in consultation with the department, and a supervisor will be assigned. The candidate will be examined orally after presenting his/her thesis.

• History 24.610T2, S2
Directed studies in one of the following aspects of modern European history: modern France (M.J. Sydenham), modern Russia (R.C. Elwood and J.W. Strong), and international history (J.L. Black and R.A. Jones).

• History 24.640T2, S2
Directed Studies in United States History
P.J. King and E.R. Kantowicz.

• History 24.650T2, S2
Directed Studies in British History
J.N. Cooper.

• History 24.688T2
Social History
A course, primarily for doctoral candidates in history, in which the literature and methodology of basic aspects of social history will be examined.
R.B. Goheen and members of the department.

• History 24.690F4, W4, S4
Directed Studies in Canadian History
A program of supervised reading with several instructors in preparation for the Ph.D. oral examination.

• History 24.699F, W, S
Ph.D. Thesis

School of Journalism

The School

Director of the School: G.S. Adam
Supervisor of Graduate Studies:
Anthony Westell

The School of Journalism offers courses leading to the degree of Master of Journalism. The emphasis in the M.J. program is on advanced professional education for those who are or intend to become practising journalists in the news media, but there is provision for students who wish to undertake research in journalism and mass media.

Students who wish to complete a non-professional degree in media and society are advised to consult with the Institute of Canadian Studies; it is possible to work out an M.A. program in these areas under the joint supervision of the institute and the School of Journalism.

Students entering the master's program will choose one of three areas of concentrated study:

Specialized Reporting
Courses provide advanced training in specialized news beats in journalism, such as politics, the economy, or international affairs.

Specialized Media
The focus of this specialty will be techniques of television, radio and documentary film. Students will be expected to work to standards of professional competence.

Media and Society
This specialty encompasses a number of topics, among which are the law of the press, journalism history, government-press relations, issues in contemporary journalism, such as those raised by the ownership and control of publishing and broadcasting in Canada, and an examination of the role of the media in society as it is conceived by selected social and political theorists.

Carleton's School of Journalism is uniquely situated for advanced journalism study. It offers ready access to many of the people and institutions that most directly influence Canadian affairs: Parliament, federal government departments and agencies, embassies, business and labour organizations, and major economic and cultural institutions are close at hand.

Qualifying-Year Program

Applicants who have three-year (pass) journalism degrees with high second-class standing may be admitted to a qualifying-year program, made up largely of courses from the Faculty of Arts. An applicant with a background in another discipline, who does not have a journalism degree or the equivalent, may be admitted to a qualifying year of basic professional studies if he or she achieved at least a B average in the previous degree.

Students who complete a qualifying-year program with high second-class standing may proceed with master's level studies the following year.

For details of the regulations governing qualifying-year programs, please refer to the general section of this calendar.

Master of Journalism

Admission Requirements

Admission to the M.J. program is selective. The basic requirement is an honours B.J. degree with at least high second-class standing or its equivalent. Long and distinguished professional experience may also serve as a basis for admission. Applicants who combine an undergraduate degree (not in journalism) and professional experience will also be considered for admission.

The school will consider the applicant's undergraduate background and/or professional experience in assigning a program of studies.

As a condition for graduation, all students are required to have a minimum of four months of practical experience in the media, and a working knowledge of a second language, preferably French.

Graduate Courses*

Students are required to complete successfully five full courses or the equivalent. They will have their work evaluated at the end of each academic term, and those working below a B- level will normally be asked to withdraw.

In 1983-84 most courses will be prescribed and students will be required to complete:

- Journalism 28.530F1
Media Theory: Traditional Approaches and Contemporary Trends
This course examines the major approaches to the analysis of the mass media. It will include discussion of the utility of each approach in making sense of the relationship between the structure of the media and the structure of modern society.

- Journalism 28.532W1
Press and Government
A critical examination of the press in the political systems of Britain, the United States, and Canada. The course will include a research component.
G.S. Adam.

- Journalism 28.540T2
Specialized Reporting
A series of seminar-workshops on approaches and problems in one area of reporting, such as politics, international affairs, labour, science, or finance. (Certain of these specialties may not be offered every year.)
Anthony Westell.

- Journalism 28.599F4, W4, S4
M.J. Thesis
The student will complete a substantial piece of public affairs journalism in any medium, *or* a research project on the mass media, *or* make a major contribution to journalism education through the production of a document on an aspect of journalism practice.

The courses described above constitute four of the required five credits. Students will choose from among the following options to complete their course requirements:

- Journalism 28.551W1
Communications Law
This intensive course is concerned with the general laws governing the mass media in Canada, with attention to their effect on freedom of expression. Specific topics for examination include contempt of court; free press; fair trial; revealing of sources; civil defamation; criminal libel; obscenity and censorship; copyright; privacy; government secrecy; and the law of advertising. (This course may not be taken by students who have completed 28.351, or 51.351, or 28.445.)

- Journalism 28.588F1
Directed Readings
Students, working under faculty direction, will undertake an intensive reading schedule in order to pursue a subject area of particular interest.

- Journalism 28.589W1
Directed Research
Students, working under faculty direction, will develop and undertake a research project in order to pursue a subject area of particular interest.

- Journalism 28.590T2, S2
Directed Studies
Reading and research tutorials.

- Journalism 28.591F1, W1, S1
Directed Studies
Reading and research tutorials.

With the approval of the school and the participating department, M.J. students may take a full course or two half-courses elsewhere in the university.

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The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

Department of Linguistics

The Department

Acting Chairman of the Department:
Aviva Freedman

The Department of Linguistics does not offer a program at the graduate level, but does offer opportunity for independent study to students in the Institute of Canadian Studies in the areas of linguistic study of the Cree, Iroquois, and Inuit languages, Canadian English and Canadian French dialectology, and the teaching of English as a second language. Members of the department are also prepared to supervise graduate theses on linguistic subjects.

In co-operation with the Faculty of Graduate Studies and Research, the department publishes the papers of the annual Algonquian Conference.

Graduate Courses*

- Linguistics 29.590F1, W1, S1
Native Languages of Canada
A tutorial to study the descriptive, historical, and anthropological aspects of selected native languages of Canada, among them Cree, Iroquois, and Inuit.
Prerequisite: Honours courses in linguistics or permission of the department.

- Linguistics 29.591F1, W1, S1
Sociolinguistic Aspects of Bilingualism
A tutorial to study the linguistic aspects of French-English bilingualism, including sociolinguistic and psycholinguistic factors.
Prerequisite: Honours courses in linguistics or permission of the department.

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Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

The Department

Chairman of the Department: David Piper

The Department of Music offers courses at the graduate level in the history of Canadian music and related fields, in co-operation with the Institute of Canadian Studies. Full use will be made of the resources of the National Library, the Public Archives, and the National Museum of Man.

Dr. Elaine Keillor is lecturer in Canadian music with Dr. Helmut Kallmann (Chief Music Librarian, National Library) as Adjunct Professor.

Graduate Courses*

• Music 30.510T2
History of Canadian Music I
Selected aspects of Canadian music from 1600 to the present; liturgical music; social and economic conditions of Canadian musical life; regional studies; individual composers.
Prerequisite: Permission of the department and the Institute of Canadian Studies.

Courses Not Offered in 1983-84

30.511 History of Canadian Music II
30.512 History of Canadian Music III

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Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

Department of Philosophy

The Department

Chairman of the Department: S.G. Clarke
Departmental Supervisor of Graduate Studies: Andrew Jeffrey

The Department of Philosophy offers programs of study leading to the degree of Master of Arts.

Qualifying-Year Program

Applicants who do not hold an honours degree (or the equivalent) will be required to register in a qualifying-year program before proceeding to the master's program.

The regulations governing the qualifying year are outlined in the general section of this calendar.

Master of Arts

Admission Requirements

The minimum requirement for admission to the master's program is an honours B.A. degree (or the equivalent) in Philosophy, with at least high second-class standing.

Qualifying-year and M.A. applicants from an institution other than Carleton University must submit two papers.

Program Requirements

The specific program requirements for master's candidates are the following:

- Philosophy 32.545, the departmental seminar
- A thesis equivalent to two full-course credits, which must be defended at an oral examination; *or* a research essay equivalent to one full-course credit
- Four half-course credits (or *six* in the case of students following the research essay option) in at least three of the following study areas: studies in the history of philosophy; studies in the work of an individual philosopher; studies in logic, epistemology, or metaphysics; studies in selected problems in philosophy.

In exceptional cases, a maximum of one full course (or the equivalent) may be selected from those offered at the 400 level, or in a related field, or at another university.

Academic Standing

A grade of B- or better must be obtained in each course and on the thesis or the research essay.

Selection of Courses

The department normally offers each year six 400-level undergraduate half-courses, which are open to students in the qualifying year and, with permission, to students in the M.A. program. For courses offered in 1983-84, please consult the undergraduate calendar.

Graduate Courses*

The following graduate courses are open to students in the M.A. program and, with permission, to students in the qualifying-year program. Five two-hour tutorial sessions will be required in each half-course.

- Philosophy 32.504F1
Tutorial in the History of Philosophy I
Detailed study of a period or issue in the history of philosophy.

- Philosophy 32.505W1
Tutorial in the History of Philosophy II
Detailed study of a period or issue in the history of philosophy.

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

• Philosophy 32.510F1
Advanced Problems in Legal Philosophy
Studies in legal theories and analyses of law advanced by Hart, Dworkin and others, and legal concepts: for example, principles, rights, duties, liability, etc. Precise course content will vary from year to year and will be announced at the beginning of the term.
Prerequisite: Philosophy 32.350 (Law 51.310), or Philosophy 32.311 and 32.312 (Law 51.311 and 51.312), or permission of the relevant department.
Patrick Fitzgerald and Randal Marlin.

• Philosophy 32.514F1
Tutorial in the Work of an Individual Philosopher I
A critical and systematic study of the work of an individual philosopher.

• Philosophy 32.515W1
Tutorial in the Work of an Individual Philosopher II
A critical and systematic study of the work of an individual philosopher.

• Philosophy 32.524F1
Tutorial in Logic, Epistemology, or Metaphysics I
An attempt to find a solution to a specific problem in logic, epistemology, or metaphysics.

• Philosophy 32.525W1
Tutorial in Logic, Epistemology, or Metaphysics II
An attempt to find a solution to a specific problem in logic, epistemology, or metaphysics.

• Philosophy 32.534F1
Tutorial in Selected Problems of Philosophy I
An attempt to find a solution to a specific problem in some area other than logic, epistemology, or metaphysics.

• Philosophy 32.535W1
Tutorial in Selected Problems of Philosophy II
An attempt to find a solution to a specific problem in some area other than logic, epistemology, or metaphysics.

• Philosophy 32.545T2
Departmental Seminar
Research papers to be given by faculty members and students.

• Philosophy 32.576W1
Ethical and Cultural Dimensions in Development Studies
Exploration of concepts of value, rights, duties, law, and obligation in relation to global development issues. Comparative analysis of major ideological and ethical foundations of regional cultures, and the problems for cross-cultural and transnational relations.
J.T. O'Manique.

• Philosophy 32.598F2, W2, S2
Research Essay

• Philosophy 32.599F4, W4, S4
M.A. Thesis

Department of Religion

The Department

Chairman of the Department: J.P. Dourley
Departmental Supervisor of Graduate Studies: S.G. Wilson

The Department of Religion offers programs of study leading to the degree of Master of Arts.

Master of Arts

Admission Requirements

The minimum requirement for admission to the master's program is an honours bachelor's degree in religion (or the equivalent) with at least high second-class standing.

Applicants who do not hold an honours degree in religion (or the equivalent) will be required to register in a qualifying-year program before proceeding to the master's program.

The regulations governing the qualifying year are outlined in the general section of this calendar.

Program Requirements

The student will choose a program of study concentrating on one of the following major areas: comparative religion, with special emphasis on one of the major traditions; biblical and ancient near eastern studies; and modern religious thought and culture. Candidates must follow either a thesis or non-thesis program. The specific requirements are as follows:

Thesis Program

- Seminars equivalent to one full course in major area
- Seminars equivalent to one full course, selected from one or both of the other areas
- Tutorial in major area for one-course credit
- Thesis (equivalent to two full courses) on a topic in major area, which must be defended at an oral examination.

Non-Thesis Program

- Seminars equivalent to three full courses; of these, at least two half-course seminars must be from the major area, at least two from a second area, and at least one from the remaining area.
- Comprehensive reading course in major area
- One additional course in major area.

The student's program will be worked out in consultation with, and with the approval of, the department's supervisor of graduate studies and its committee on graduate studies. The prescribed program will take into account the student's background and special interests, as well as the research interests and competence of the staff.

Language Requirements

The student will be required to acquire, or to demonstrate that he/she already has, a reading knowledge of whatever language is essential to his/her research.

Students are advised to consult the departmental handbook for further regulations.

Graduate Courses*

- Religion 34.511W1

Seminar in Comparative Religion: The World of Islam in the Eyes of Al-Ghazali (d. 1111)
A study of one of the central scholars of Islam, dealing with his translated works. His numerous perspectives on Islam (legal, theological, philosophical, and mystical) will be analyzed.
L.T. Librande.

- Religion 34.512T2, S2

Tutorial in Comparative Religion

- Religion 34.513F1, W1, S1

Directed Studies in Comparative Religion
Seminar for additional study in this area.

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Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

• Religion 34.520F1
Seminar in Biblical and Ancient Near Eastern Studies: Literary-Structural Studies of the Deuteronomic History
This seminar assumes the unity of Deuteronomy — 2 Kings, and will attempt to describe key features of its framework. This will involve a synchronic study, unencumbered by prior diachronic assumptions, and directed toward a compositional analysis. Russian literary critics, such as M. Bakhtin and B. Uspensky, will provide a theoretical basis for this approach.
R.M. Polzin.

• Religion 34.522T2, S2
Tutorial in Biblical and Ancient Near Eastern Studies

• Religion 34.523F1, W1, S1
Directed Studies in Biblical and Ancient Near Eastern Studies
Seminar for additional study in this area.

• Religion 34.530F1
Seminar in Modern Religious Thought and Culture: Religion and Psyche in the Psychology of C.G. Jung
An examination of Jung's psychology under his rubric of the psyche as matrix of religious experience, and the religious implications of his psychology in itself, and in its relations of complementarity or contradiction with other psychologies and theological anthropologies.
J.P. Dourley.

• Religion 34.532T2, S2
Tutorial in Modern Religious Thought and Culture

• Religion 34.533F1, W1, S1
Directed Studies in Modern Religious Thought and Culture
Seminar for additional study in this area.

• Religion 34.590T2, S2
M.A. Comprehensive Reading
Not open to students pursuing a thesis program.

• Religion 34.599F4, W4, S4
M.A. Thesis

Courses Not Offered in 1983-84

34.510 Seminar in Comparative Religion
34.521 Seminar in Biblical and Ancient Near Eastern Studies
34.530 Seminar in Modern Religious Thought and Culture

Department of Spanish

The Department

Chairman of the Department: Ross Larson
Departmental Supervisor of Graduate Studies: C.A. Marsden

The Department of Spanish offers a master's program, with specialization in either Peninsular or Spanish-American literature, or a combination of both.

All requests for more information concerning the program should be addressed to the departmental supervisor of graduate studies. The department will supply reading lists for individual courses and for the general comprehensive examination, and a brochure containing details of particular requirements and other information related to Spanish studies at Carleton.

Master of Arts

Admission Requirements

The requirements for admission to the master's program are outlined in the general section of this calendar.

Program Requirements

The minimum program requirements for master's candidates are stated in the general section.

The master's program may be undertaken in one of the following optional patterns:

- Three full courses (or the equivalent, not including 38.595), and a thesis equivalent to two full courses
- Five full courses (or the equivalent, not including 38.595).

The Department of Spanish encourages candidates to select the thesis pattern.

The department also requires all students to undertake general comprehensive examinations, and to complete a non-credit seminar on bibliography and research methods.

In certain circumstances, students wishing to study aspects of Hispanic literature not specifically offered by the department may enrol in Spanish 38.590 or 38.591: Directed Studies, if a specialist in the desired field is available.

All courses taken by graduate students shall be chosen in consultation with the department. From time to time certain courses offered by other departments may be accepted as part of the master's program in Spanish, and special arrangements may occasionally be made to undertake part of the program at universities in Spanish-speaking countries.

Selection of Courses

The following senior undergraduate courses are open to students in the qualifying-year program and, with permission, to students in the M.A. program.

Spanish

38.415 Medieval Spanish Literature from the Origins through 1300
38.416 Medieval Spanish Literature, 1300-1500
38.420 Cervantes
38.430 Modern Spanish Novel
38.431 Contemporary Spanish Novel
38.435 Modern Spanish Drama
38.436 Contemporary Spanish Drama
38.440 Modern Spanish Poetry
38.441 Contemporary Spanish Poetry
38.460 Twentieth-Century Spanish-American Novel I
38.461 Twentieth-Century Spanish-American Novel II
38.470 Twentieth-Century Spanish-American Poetry I
38.471 Twentieth-Century Spanish-American Poetry II
38.490 Seminar on a Special Topic
38.491 Seminar on a Special Topic
38.492 Special Studies

Graduate Courses*

• Spanish 38.515F1
Aspects of Medieval Literature: *Libro de Alexandre*
A critical-literary study of this important work of the *Mester de clerecía*, in terms of authorship, metrics, grammar, and problems of its literary textual criticism.
José Jurado.

• Spanish 38.520F1
Special Topic on Golden Age Literature: Góngora
Close textual reading of major and minor works of Góngora against a background of previous and current attitudes toward *culteranismo* and *conceptismo*.
C.A. Marsden.

• Spanish 38.530W1
Problems of Modern Spanish Literature:
The Novel of the Spanish Civil War
A study of the principal novels which have focused on the Spanish Civil War, from *Requiem por un campesino español* (1950) of Sender, to *Autobiografía de Federico Sánchez* (1979) of Semprún.
Angel López-Fernández.

• Spanish 38.560T2
Aspects of Spanish-American Literature after 1888: The Spanish-American Novel since 1947
Analysis and interpretation of works by Asturias, Carpentier, Rulfo, Vargas Llosa, Fuentes, Cortázar, García Márquez, and others.
Ross Larson.

• Spanish 38.570F1
Special Problems in Spanish-American Literature:
Literature by Writers of African Descent
The development of literary Blackness in Spanish America, with a focus on major Black authors in order to determine their racial, social, and literary significance.
R.L. Jackson.

• Spanish 38.570W1
Special Problems in Spanish-American Literature:
The Concept of Irony in Twentieth-Century Spanish-American Literature
The study of various theories of irony, and the analysis of both its stylistic and thematic manifestations in a limited number of major twentieth-century Spanish-American writers, with examples from poetry, prose, fiction, and theatre.
P.J. Roster.

• Spanish 38.590T2, S2
Directed Studies

• Spanish 38.591F1, W1, S1
Directed Studies

• Spanish 38.595F1, W1, S1
Directed Readings
Additional half-courses, designed in particular for students requiring special assistance in preparing for comprehensive examinations.

• Spanish 38.599F, W, S
M.A. Thesis

Courses Not Offered in 1983-84

38.505 History of the Spanish Language I
38.506 History of the Spanish Language II
38.525 Studies in Eighteenth-Century Literature
38.550 Aspects of Spanish-American Literature before 1888

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

Departmental Program Descriptions and Details of Courses

Faculty of Engineering

Dean: J.S. Riordon

Programs of study are offered by the Faculty of Engineering leading to the degrees of Master of Engineering and Doctor of Philosophy in Aeronautical, Civil, Electrical, and Mechanical Engineering, to the degree of Master of Engineering in Materials Engineering and, in co-operation with the Faculty of Science, to the degree of Master of Science in Information and Systems Science.

The areas of current research, the research facilities available, and the graduate courses offered, are given in the following pages for the four departments of the faculty:

- Civil Engineering
- Electronics
- Mechanical and Aeronautical Engineering
- Systems and Computer Engineering

Both the master's and Ph.D. programs may be undertaken on a full-time or part-time basis.

General information on awards and financial assistance is given in that section of this calendar.

A limited number of students who are not degree candidates may be admitted to each graduate engineering course. Credit earned as a special student normally cannot be credited towards a graduate degree in engineering.

Computing Facilities

The University has a central system with comprehensive facilities, including a large number of time-sharing terminals, remote job entry from the Mackenzie Building for batch, and a plotter and graphics. A large number of minicomputers, including four with disc-operating systems and interactive graphics, are in use by the various engineering departments.

Special Arrangements

Research in an Outside Institution

A student may apply for permission to carry out his/her research, in part or whole, in an outside institution (for example, industrial, governmental, or university laboratory). Such an application, addressed to the dean of graduate studies and research through the dean of engineering, should:

- Include a detailed statement of the research proposal, of arrangements for supervision, and of the circumstances under which it is to be carried out
- Establish that the applicant will be able to pursue independent research
- State the facilities available for the research
- Include a proposed time schedule
- Be accompanied by a supporting letter from a responsible person in the outside institution giving approval of the proposal and accepting these regulations.

Part-time Thesis Research

A part-time research program may be permitted if the conditions for the "presence" of the student (outlined under faculty regulations) are satisfied. It is the responsibility of the research supervisor to define the fraction of full-time research engaged upon by the student so that this can appropriately be credited to his/her program and assessed for payment of tuition fees. Before permission to undertake research on a part-time basis can be granted, the student must submit in writing, to the dean of graduate studies and research through the dean of engineering, a statement of his/her proposed manner of working part-time, supported by a letter of approval from his/her employer.

Waiver of Thesis

A candidate for the master's degree who has, before admission, completed independent research or development projects of an adequate level of accomplishment, may apply to the chairman of the department concerned for a waiver of the thesis requirement. Such application must be made at the time of initial registration, and must be supported by copies of published reports describing the work. If the application is approved, the candidate must complete 10 half-courses or the equivalent, six of which must be graduate-level courses in engineering, to fulfil the requirement for the award of a degree without a thesis. A candidate who has been granted a waiver of the thesis requirement will be required to take an oral examination on the subject of one of his/her published papers and topics related to his/her field of specialization.

Transfer of Credit

Normally credit for one full graduate course completed at another university may be accepted in partial fulfilment of degree requirements, provided that the course is appropriate to the candidate's program at Carleton. Under special circumstances a second full course may be allowed. Refer to the general section of this calendar for details of the rules governing transfer of credit.

Transfer from Master's to Ph.D. Program

A student who shows outstanding academic performance and demonstrates high promise for advanced research during the full-time master's program at Carleton may, subject to meeting the requirements below, be permitted to transfer into the Ph.D. program without receiving the master's degree. Such a student must complete the course requirements and thesis registration requirements of the master's program, but is exempted from submission of the thesis.

A student wishing to transfer should apply to the chairman of his/her department. If the department and the Faculty of Graduate Studies and Research approve the application, the candidate will be required to take the comprehensive examination for the Ph.D. The requirements for the comprehensive examination will then include the submission of a report on research to date, and a research proposal for the Ph.D.

After successfully passing the comprehensive examination, the student will be admitted to the Ph.D. program with normal program requirements (but with the comprehensive examination to his/her credit). If unsuccessful, he/she will remain in the master's program and be required to submit the thesis in the usual way.

Faculty Regulations

Graduate students in the Faculty of Engineering are governed by the section of this calendar entitled General Regulations, and by the regulations stated in that section.

All graduate students in the Faculty of Engineering must obtain satisfactory grades in their course work, must make satisfactory progress in their research if a thesis is included in their program, and must satisfy the following criteria of activity or "presence" in the program:

- Maintain a close working relationship with their research supervisor
- Attend the courses for which they are registered
- Submit written reports and present seminars as required by their supervisor
- Attend departmental seminars held regularly to discuss current research and related topics. Each student is required from time to time to present a seminar on his/her research; part-time students who are not actively engaged in research are exempt from the seminar requirement.
- Be readily available on an informal basis.

Thesis Regulations

The thesis must represent the result of the candidate's independent research or development work, undertaken after admission to graduate studies at Carleton University. Experimental or theoretical results previously published by the candidate may be used only as introductory or background material for the thesis. A candidate may be permitted to carry on thesis research work off campus, provided that the work is approved in advance, and arrangements have been made for supervision of thesis research activities by a faculty member of Carleton University. A part-time student may use the Faculty of Engineering laboratory facilities for on-campus thesis research and development activities.

Each candidate submitting a thesis will be required to undertake an oral examination on the subject of the thesis and related fields.

Registration and Course Selection

- Undergraduate engineering courses may not normally be taken for credit.
- All students require departmental approval for their program of studies, for course registration, and for any changes to their status or program.
- Each full-time student is required, in any fall or winter term in which he/she has outstanding program requirements of three or more half-courses, to register for credit in at least three half-courses. After the last day for withdrawal from courses in each such term, the student must remain registered in at least three half-courses.

• For part-time students, the department will arrange the appropriate course loading and selection.

Master of Engineering

Admission Requirements

Applicants are admitted under the general regulations specified in this calendar, but, in addition, are required to have strong undergraduate preparation in the appropriate engineering disciplines, computer programming, mathematics, and physics.

Program Requirements

Two alternatives are available for full-time students studying towards the degree of Master of Engineering, one involving a thesis plus course work; the other involving course work only. The choice of these alternatives must be arranged and approved at the time of admission into the program. Students are encouraged to take at least one half-course outside of their department.

M.Eng. by Thesis

• A thesis based on the student's research

• A minimum of six half-courses in engineering or a related discipline. The number of courses required by each department is specified in its section of this calendar.

M.Eng. by Course Work

This program involves 12 half-courses in engineering or a related discipline; no thesis is required. It is intended for students whose career objectives are best satisfied by a somewhat broader extension of their engineering background knowledge than that offered by a more specialized research program. The course of study will be tailored to suit the career objectives of each student individually. Specific program requirements are detailed in the departmental sections of this calendar.

In the Departments of Electronics and Systems and Computer Engineering, a course work M.Eng. may be pursued in the co-operative program which is conducted jointly with firms and laboratories in the Ottawa area. In this program, the student alternates work terms with full-time academic terms. One-third of the course work requirement consists of project courses, which are based on the engineering study, analysis, or design accomplished during the work terms.

Doctor of Philosophy

Admission Requirements

For admission to the Ph.D. program, an applicant must normally hold a master's degree in engineering (or its equivalent) and, by his/her previous program of study and scholastic record, demonstrate a capacity for advanced study and research. Experience gained while working in an engineering or research environment will be taken into account when assessing an application. The applicant must specify his/her intended field of research.

Program Requirements

The specific program requirements for the Ph.D. degree are the following:

• A minimum of two calendar years of full-time study (or the equivalent)

• Course requirements as established on admission, but not less than six half-courses, or equivalent, in total; these requirements must include at least four graduate-level half-courses in engineering and at least one full course in an appropriate discipline outside the Faculty of Engineering.

• Substantial research

• A thesis on the research.

Advisory Committee

An advisory committee with at least three members will be appointed by the department soon after a student's first registration. It has the responsibility of ensuring that conditions for the pursuit and completion of the student's program are fulfilled, and it reviews his/her progress at least once a year.

Comprehensive Examination

The comprehensive examination is held approximately one year after initial registration in the program in the case of full-time students, and at an equivalent time in the case of part-time students.

The purpose of the examination is threefold:

- To assess the student's comprehensive knowledge of his/her field of study
- To assess the preparedness and capability of the student for doctoral research
- To judge the suitability of the research topic for a doctoral thesis.

The student is required to present his/her research proposal, and to be subjected to oral and written examination in appropriate fields of study. He/she will be informed by the advisory committee of the specific requirements of the examination. Having successfully completed the comprehensive examination, the student becomes a doctoral candidate.

The Department

Chairman of the Department: A.P.S. Selvadurai
Departmental Supervisor of Graduate Studies: G.A. Hartley

The Department of Civil Engineering offers programs of study and research leading to the Master of Engineering and Ph.D. degrees in Civil Engineering.

The department conducts research and has developed graduate programs in the following areas:

- Structural Mechanics

The graduate program in structural mechanics concentrates on analytical and design studies in the following fields: computer applications in structural analyses; behaviour of steel, concrete and composite structures; structural dynamics, seismic analysis; structural optimization; finite element analysis. Graduate research in structural mechanics is currently directed to the following areas:

Computer Applications in Structural Design
Computer-based systems for analysis, design, and graphics processing; structural analysis of building frames; pre- and post-processing of frame analysis and finite element analysis packages in structural applications.

Seismic Analysis and Design
Seismic response of set-back and other irregular buildings; computer analyses of linear and nonlinear structural response; design of buildings for seismic forces

Continuum Mechanics
Linear and nonlinear problems in elasticity; analysis of contact problems in elasticity, plasticity, and viscoelasticity; mechanics of composite materials; fracture processes in geological materials; finite deformations of rubberlike materials

- Building Design and Construction

The graduate program in building design and construction emphasizes the following fields: masonry behaviour and design, timber structures; structural systems and design optimization; integrated treatment of structural, mechanical, and electrical building requirements; construction economics, project planning. Graduate research in building design and construction is currently directed to the following areas:

Computer-Aided Building Design
Development of applications software for design of building structural components and systems

Masonry Behaviour and Design
Shear strength of reinforced masonry beams; masonry deformations; floor systems for masonry structures; winter masonry construction

Timber Structures
Performance, analysis, and evaluation of timber truss systems, housing applications

Optimization of Buildings
Optimum design of reinforced concrete and other composite construction taking into account structural, architectural, and other service constraints

- Transportation Planning and Technology

The graduate program in transportation planning and technology deals with problems of policy, planning, economics, design, and operations in all modes of transportation. In the area of transportation planning, the focus is on the design of transport systems, including terminals, modelling and simulation, urban and regional studies, traffic engineering, and geometric design. In the transportation technology area, programs deal with technology of vehicles and facilities, acoustics and noise, materials and pavement design. Graduate research in transportation is currently focused on the following areas:

Transport Policy
Assessment and impact analysis of national, regional, and urban transportation policies

Planning and Design Methodology
Development and application of models for optimization of transport supply, transportation system management

Travel and Traffic Analyses
Behavioural theories of passenger travel, goods movement, empirical traffic studies

Transportation Terminals
Airport planning, air terminal design; bus, rail, subway terminal design, layout methods, pedestrian traffic

Transportation Technology Development and Assessment
Modernization of passenger and freight rail services; soil properties, pavement design, multi-layered systems, highway design, energy

- Geotechnical Engineering

The graduate program in geotechnical engineering places an emphasis on both theoretical and applied problems related to soil and rock mechanics and foundation engineering. These generally include the study of mechanical properties of soil and rock materials, stability of natural slopes and earth embankments, soil-foundation-structure interaction, and problems in foundation design and geomechanics. Broader programs in geotechnical engineering may be arranged by making use of courses offered in the Department of Geography at Carleton University and in the Department of Civil Engineering at the University of Ottawa. Graduate research in geotechnical engineering is primarily directed towards the following areas:

Soil-Foundation Interaction
Elastic and consolidation effects of soil-foundation interaction; soil-frame interaction; contact stress measurement; performance of rigid and flexible foundations; buried pipelines

Bearing Capacity and Settlement
Problems related to design of bridge abutments and footings located on sloped granular fill, experimental and field studies

In-Situ Testing of Soils
The use of devices such as the pressure meter, the screw plate test, the borehole shear device, and borehole dilatometer in the assessment of geotechnical properties of soils

Mechanical Behaviour
Development of constitutive relations for soils and rock masses with yield and creep characteristics; applications to foundation engineering

Mechanics of Geological Structures
Large strain phenomena; buckling of strata; applications to underground storage structures; hydraulic fracture of oil- and gas-bearing geological media

Performance of Anchors
Theoretical and experimental analysis of deep and shallow anchors in soil, rock, and concrete; group action; creep effects; prestress loss

Nuclear Waste Disposal
Theoretical modelling of rockmass-buffer-canister interaction during moisture migration; non-homogeneous swelling of buffer materials; swelling pressures in buffer systems

Laboratory facilities include a 400,000 lb. universal testing machine with auxiliary equipment for load and strain control; an electro-testing machine, specialized equipment for torsion and impact studies; advanced equipment for electric resistance strain gauge work; and a wide selection of other loading, measuring, and recording equipment for testing structural materials and components. The concrete laboratory has facilities for the casting, curing, and testing of reinforced concrete members. Laboratory facilities in geotechnical engineering include both large scale and conventional tri-axial testing, consolidation testing, pore water pressure measurements, and model studies of contact stress measurements. The soil dynamics and highway materials laboratories provide facilities for studies of the physical properties of soil, stabilized soil, aggregate and bituminous mixtures.

Computer-related equipment within the department comprises several minicomputers; five terminals, including two storage scope display terminals; and a digitizing table. This equipment is interfaced to the Honeywell Level 66 computer in the University computer centre. A library of computer programs for structural engineering is a significant resource for advanced study and research.

Master of Engineering

Admission Requirements

The normal requirements for admission to the master's program are outlined in the Faculty of Engineering and general sections of this calendar.

Program Requirements

M.Eng. by Thesis

- Seven half-courses and a thesis

M.Eng. by Course Work
- 12 half-courses, including the project course Engineering 82.590

The variety of courses offered allows the student either to attain a depth of study in more than one field, or to concentrate in one major area. The program has been structured so that it is possible to complete the course of study in one academic year.

Doctor of Philosophy

Admission and program requirements for the Ph.D. degree are outlined in the Faculty of Engineering section of this calendar.

Graduate Courses*

- Engineering 82.511F1
Introductory Elasticity
Stresses and strains in a continuum; transformations, invariants; equations of motion; constitutive relations, generalized Hooke's Law, bounds for elastic constants: strain energy, superposition, uniqueness; formulation of plane stress and plane strain problems in rectangular Cartesian and curvilinear co-ordinates; Airy-Michell stress functions and Fourier solutions, application of classical solutions to problems of engineering interest.
A.P.S. Selvadurai.

- Engineering 82.512W1
Advanced Elasticity
Continuation of topics introduced in Engineering 82.511. Complex variable solutions. Torsional and thermal stresses; axially symmetric three-dimensional problems, Love's strain potential, Boussinesq-Galerkin stress functions: problems related to infinite and semi-infinite domains. Introduction to numerical methods of stress analysis, comparison of solutions.
Prerequisite: Engineering 82.511 or permission of the department.
A.P.S. Selvadurai.

- Engineering 82.513W1
Finite Element Methods in Stress Analysis
Finite element theory and numerical methods. Constant strain triangles. Linear strain triangles. Reinforced triangles. Axi-symmetric shells. Axi-symmetric solids. Plates in bending. Throughout the course, application to engineering problems is emphasized.
W.H. Bowes.

- Engineering 82.514W1
Earthquake Analysis and Design of Structures
Structural dynamics, single and multidegree of freedom systems, formulation of equations of motion, free and forced vibrations, normal mode analysis. Seismological background, selection of design earthquake. Deterministic analysis of earthquake response, linear and nonlinear analysis, influence of foundation medium. Design considerations and code requirements, equivalent static load method, response spectrum approach.
J.L. Humar.

- Engineering 82.515S1
Advanced Finite Element Analysis in Structural Mechanics
Review of finite element concepts: equilibrium; sources of error; convergence; the Patch Test. Virtual Work formulation. Calculus of variations: functional; variation; Euler's equation; notation of Lagrange; variational formulation. Curvilinear co-ordinates; Lagrange interpolation; Isoparametric elements; Gauss quadrature; work equivalent loads. Nonlinear elasticity; iterative and incremental solutions. Plasticity: yield criteria, flow, and hardening rules; development of matrix relationships and solution algorithm. Geometrically nonlinear problems: large displacements and finite strains; development of Green's and Alamsi's strain tensors, physical interpretation of nonlinear terms; matrix formulation and incremental solution.
Prerequisite: Engineering 82.513 or permission of the department.
G.A. Hartley.

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

• Engineering 82.523W1
Theory of Structural Stability
Elastic and inelastic behaviour of beam-columns; elastic and inelastic buckling of frames; application of energy methods to buckling problems; lateral-torsional buckling of columns and beams; buckling of plates; local buckling of columns and beams.
Prerequisite: Engineering 82.525 or equivalent.

• Engineering 82.524F1
Behaviour of Steel Structures
Steel as a structural material; bolted and welded connections; brittle fracture and fatigue; members subjected to combined bending and compression, and to twist and local buckling; structural stability of frames.
J.L. Humar.

• Engineering 82.525F1
Analysis of Elastic Structures
Application of matrices to structural analysis; force and displacement method of analysis for framed elastic planar and space structures; introduction to structural dynamics.
G.A. Hartley.

• Engineering 82.526W1
Prestressed Concrete
Outline and scope of design concepts. Flexural behaviour, shear, bond, losses. End block design. Post-tensioned slabs. Some considerations on bridge design. Pavements. Design optimization.
Prerequisite: Engineering 82.528 or permission of the department.
J.J. Salinas.

• Engineering 82.527W1
Advanced Structural Design
A number of topics, such as the evolution of a structure, structural form, aesthetics, progressive collapse, and design in various structural materials, are treated by members of the department and outside experts.
John Adjeleian and G.T. Suter.

• Engineering 82.528F1
Advanced Reinforced Concrete
The research background, development, and limitations in current building code provisions for reinforced concrete; yield line theory of slabs; safety and limit states design; computer design of concrete structures.
C.M. Allen.

• Engineering 82.529S1
Case Studies in Geotechnical Engineering
The critical study of case histories relating to current procedures of design and construction in geotechnical engineering. The importance of instrumentation and monitoring field behaviour will be stressed. In-situ testing.
G.C. McRostie.

• Engineering 82.530F1
Advanced Soil Mechanics I
Effective stress, pore pressure parameters, saturated and partially saturated soils; seepage; permeability tensor, solutions of the Laplace equation; elastic equilibrium; anisotropy, non-homogeneity, consolidation theories; shear strength of cohesive and cohesionless soils.
K.T. Law.

• Engineering 82.531W1
Advanced Soil Mechanics II
Plasticity in soil mechanics; failure and yield criteria, plastic equilibrium, upper and lower bound solutions, uniqueness theorems; statically and kinematically admissible states; stability analysis of cohesive and cohesionless soils.
A.P.S. Selvadurai.

• Engineering 82.533F1
Pavements and Materials
An analysis of the interaction of materials, traffic, and climate in the planning, design construction, evaluation, maintenance, and rehabilitation of highway and airport pavements.
D.R. MacLeod.

• Engineering 82.534F1
Intercity Transportation, Planning and Management
Current modal and intermodal issues, including energy. Framework and process of intercity transport planning and management. Recent trends and system development. Passenger and freight demand and service characteristics. Future prospects and possibilities.
A.M. Khan.

• Engineering 82.535F1
Traffic Engineering
Introduction to principles of traffic engineering. Basic characteristics of drivers, vehicles, and traffic. Volume, speed, and delay studies. Traffic stream characteristics and queueing theory. Capa-

city analysis of roads and intersections. Safety.
J.P. Braaksma.

• Engineering 82.536W1
Highway Materials
Materials characterization and strength evaluation of soils, stabilized soils, aggregates, and asphalt concrete. Effects of low temperatures and frost on materials behaviour.
D.R. MacLeod.

• Engineering 82.537W1
Urban Transportation Planning and Management
Urban transportation systems planning and management. Urban development models - an introduction. Urban transportation policy.
W.F. Johnson.

• Engineering 82.538W1
Geometric Design
Basic highway geometric design concepts. Vertical and horizontal alignment. Cross-sections. Interchange forms and design. Adaptability and spacing of interchanges. Design of operational flexibility; operational uniformity, and route continuity on freeways.
D.R. MacLeod.

• Engineering 82.539W1
Intercity Transportation Supply
Advanced treatment of intercity transportation planning and management concepts and techniques: transport supply issues, capacity and costs, evaluation of system improvements and extensions, transportation and development, policy impact analysis.
A.M. Khan.

• Engineering 82.541W1
Transportation Economics and Policy
Transportation, economic analysis framework. Transport industry output. Carrier operations. Issues of resource utilization, measurement, economics of supply of infrastructure, pricing; subsidies, externalities. Transport policy in Canada.
Zis Haritos.

• Engineering 82.550F1
Earth Retaining Structures
Approaches to the theoretical and semi-empirical analysis of earth retaining structures. Review of the earth pressure theories. Analysis and design methods for rigid and flexible retaining walls, braced excavations, and tunnels. Instrumentation and performance studies.
G.E. Bauer.

• Engineering 82.551W1
Foundation Engineering
Review of methods of estimating compression and shear strength of soils. Bearing capacity of shallow and deep foundations. Foundations in slopes. Pile groups. Use of in-situ testing for design purposes. Instrumentation and performance of prototype structures. Design codes.
G.E. Bauer.

• Engineering 82.552W1
In-Situ Methods in Geomechanics
Scope of a subsurface exploration program. Techniques of soil and rock sampling. Geophysical methods. Mechanical and hydraulic properties of soil and rock. In-situ determination of strength, deformability and permeability of soils and rocks. Critical evaluation of vane, pressuremeter, screw plate, flat dilatometer, borehole shear and plate load tests. Pumping, recharge and packer tests. Permeability of jointed rocks. Rock testing techniques, borehole dilatometer, flat jack, cable jacking tests. Properties of rock joints. In-situ stress measurements.
A.P.S. Selvadurai.

• Engineering 82.553S1
Numerical Methods in Geomechanics
Critical review of advanced theories of soil and rock behaviour. Linear elasticity, non-homogeneity and anisotropy. Plasticity models; Generalized Mohr-Coulomb and Drucker-Prager failure criteria. Critical state and cap models. Dilatancy effects. Associated and non-associated flow rules. Hardening rules, hypoelasticity. Soil consolidation, viscoelasticity and creep behaviour of rock masses. Rock joints. Finite element formulation of nonlinear problems. Iterative schemes; tangent stiffness, initial stress and initial strain techniques, mixed methods. Time marching schemes. Solution of typical boundary value problems in geomechanics with the aid of existing research class finite element codes.
Prerequisites: Engineering 82.511, 82.513, or permission of the department.
A.P.S. Selvadurai.

• Engineering 82.560S1
Project Management
Introduction to managing the development, design, and construction of buildings. Examination of project management for the total development process, including interrelationships among owners, developers, financing sources, designers, contractors, and users; role and tasks of the project manager; setting of project objectives; feasibility analyses; budgets and financing; government regulations; environmental and social constraints, control of cost, time, and content quality and process; human factors.
William Dawson.

• Engineering 82.563S1
Computer-Aided Design of Building Structures
Relevant aspects of computer systems, information handling, auxiliary storage; design methods, computerized design systems; computer graphics; application of structural theory; examination of a selected series of structural engineering programs and programming systems.
E.W. Wright.

• Engineering 82.570F1, W1, S1
Special Topics in Building Design and Construction
Courses in special topics related to building design and construction, not covered by other graduate courses; details will be available some months prior to registration.

Topics for Spring 1984

• Engineered Masonry Behaviour and Design
Properties of brick, block, mortar, grout, and steel. Testing, field control, and inspection. Structural behaviour and design of plain and reinforced masonry walls, beams, and columns. High rise design and earthquake requirements.
G.T. Suter.

• Advanced Methods in Computer-Aided Design
Representation and processing of design constraints (such as building codes and other design rules); decision tables; constraint satisfaction. Automatic integrity and consistency maintenance of design databases; integrated CAD systems. Introduction to geometric modelling; representation of complex three-dimensional shapes.
N.M. Holtz.

• Statistics, Probabilities and Decision Making: Applications in Civil Engineering
Review of basic concepts in statistics. Experiment design. Data analysis. Regression analysis. Use of available computer software. Review of basic concepts in the theory of probabilities. Commonly used distribution functions. Reliability. Limit states design. Selected applications in transportation, geomechanics, and structures. Emphasis will be given to problem solving. Use of existing computer software.
J.J. Salinas.

• Engineering 82.572F1, W1, S1
Special Topics in Geotechnical Engineering
Courses in special topics in geotechnical engineering, not covered by other graduate courses; details will be available some months prior to registration.

Topic for Spring 1984

• Analysis of Embankments and Slopes
Stability of embankments of soft clays; stress-strain analysis; anisotropy; strain rate effect; short and long-term settlement; methods of slope stability analysis; progressive failure; use of stability charts; slope analysis for residual and unsaturated soils.
K.T. Law.

• Engineering 82.574F1, W1, S1
Special Topics in Transportation Planning and Technology
Courses in special topics in transportation engineering, not covered by other graduate courses; details will be available some months prior to registration.

Topic for Fall 1984

• Airport Planning
Framework for airport planning and design. Aircraft characteristics; demand forecasting; airport site selection; noise, airside capacity; geometric design; the passenger terminal complex; cargo area; general aviation; ground transportation; land use planning.
J.P. Braaksma.

Topic for Winter 1984

• Terrain Assessment
Air photo interpretation to evaluate the physical environment for engineering and environmental

planning studies. Engineering significance of landforms and materials.
D.R. MacLeod.

Topic for Fall 1983

- Transportation Terminals
Framework for passenger terminal planning and design. Theory: the transfer function and network modelling; pedestrian flow characteristics; capacity of corridors, stairs, escalators, and elevators; layout planning. Practical applications: air, rail, metro, bus, ferry, and multi-modal terminals.
J.P. Braaksma.

- Engineering 82.590F2, W2, S2
Civil Engineering Project
Students enrolled in the M.Eng. program by course work will conduct an engineering study, analysis, or design project under the general supervision of a member of the department.

- Engineering 82.596F1, W1, S1
Directed Studies

- Engineering 82.599F3, W3, S3
M.Eng. Thesis

- Engineering 82.699F, W, S
Ph.D. Thesis

Other Courses of Particular Interest

Mechanical and Aeronautical Engineering
88.514 Ground Transportation Systems and Vehicles
88.517 Experimental Stress Analysis
88.521 Methods of Energy Conversion
88.550 Advanced Vibration Analysis
88.561 Design Theory and Practice
88.562 Failure Prevention
88.568 Deformation of Materials

Systems and Computer Engineering
94.501 Simulation and Modelling
94.515 Socioeconomic System Models

Geography
45.415 Slope Development: Forms, Processes and Stability
45.417 Glacial Geomorphology
45.533 Periglacial Geomorphology
45.534 Aspects of Clay Mineralogy and Soil Chemistry
45.579 Research and Development in Recreational Geography

Public Administration
50.510 Management Accounting
50.511 Financial Management

Department of Civil Engineering, University of Ottawa
CVG 5100 Foundations
CVG 5101 Analysis of Stress and Strain in Rock Masses
CVG 5104 Soil Testing and Properties
CVG 5105 Slope Stability
CVG 5106 Soil Engineering
CVG 5147 Theory of Plates
CVG 5148 Theory of Shells
CVG 5341 Finite Element Methods I
CVG 5349 Mine Waste Embankments

Department of Electronics

The Department

Chairman of the Department: A.R. Boothroyd
Departmental Supervisor of Graduate Studies: R.G. Harrison

The Department of Electronics offers programs of study and research leading to the master's and Ph.D. degrees in electrical engineering.

Areas of specialization include the following interrelated fields:

Integrated Circuit Engineering
Design and development of linear and digital integrated circuits, fabrication processes and test techniques; Bipolar and MOS ICs; CCDs; VLSI, computer-aided circuit design; scanning electron microscopy; laser annealing studies

Solid State Devices
Semiconductor device development; device modelling; device innovation; new device processes; sensors and transducers; special devices for instrumentation; small geometry devices

Solar Energy Conversion
Photovoltaics; solar cells; materials studies for solar cells; arrays; systems for electricity generation; instrumentation for energy systems

Circuits and Circuit Theory
Active filters; linear and nonlinear circuit design; computer-aided circuit design

Microwave Electronics
Microwave amplifiers, oscillators, modulators, frequency converters, phase-shifters; use of FET and bipolar transistors, Schottky barrier, varactor, step recovery and PIN diodes; design using finline, microstrip, stripline, coax, and waveguide

Communications Electronics
Circuits for terrestrial and satellite communications; circuit implementation of digital modulation techniques; characterization of nonlinearities in circuits; mobile radio; spacecraft antenna design; communication channel characterization; optical communications circuits

Industrial Instrumentation Electronics
Industrial measurement and process control; radar remote sensing; application of basic electromagnetics and circuit technology

Technology of Analog Signal Processing
Switched capacitor filters, transversal filters, CCD delay lines, use in analog signal processing applications

The structure of courses offered allows a well-integrated master's or Ph.D. program of study to be chosen, appropriately related to the field of thesis research. Basic courses cover semiconductor device theory, circuit and electromagnetic engineering. Application-oriented courses include integrated circuit design, instrumentation techniques, communication circuits, microwave measurements and circuits, semiconductor device design and fabrication processing, and microprocessor electronics.

The research program of the department is conducted in the Electronics Research Laboratory, the function of which is to promote, co-ordinate, and organize research in the above-listed fields. The laboratory maintains extensive collaboration with government and industrial research and development agencies in the Ottawa area.

Excellent facilities are available for the fabrication of solid state devices and integrated circuits for research purposes. These include a laboratory in which processes required in silicon monolithic technology can be carried out under conditions of cleanliness and control comparable with those in industrial research laboratories. Among equipment items available are modern diffusion furnaces, an epitaxial reactor system, a high-power cw Argon laser for laser annealing of silicon, facilities for photolithography and mask-making, systems for thin and thick film deposition, scribing and bonding. Well-developed laboratory capability exists for the testing and assessment of semiconductor devices and integrated circuits, including probing and SEM facilities. An extensive facility for photovoltaics research includes a microcomputer-controlled solar simulator for AM0, AM1, and AM2 solar spectra.

The department is well equipped for circuit and measurement work over the range from dc through 18 GHz, and including optical frequencies. Sophisticated special purpose facilities include network analyzer systems, amplitude analyzers, spectrum analyzers, a microwave link analyzer, time domain reflectometers, HF and microwave frequency counters, signal sources and microwave sweepers, power meters, high-quality data recorders,

a data generator and bit error rate detector system, and a wide selection of components and adapters spanning the frequency from dc to 18 GHz.

Master of Engineering

Admission Requirements

The normal requirements for admission to the master's program are outlined in the Faculty of Engineering and general sections of this calendar.

Program Requirements

M.Eng. by Thesis

- Six half-courses and a thesis

M.Eng. by Course Work

- 12 half-courses, which may include project course Engineering 97.590 or Engineering 97.591. To qualify for entry to this program, the student should have at least two years of appropriate engineering experience.

M.Eng. Co-operative Program

- 12 half-courses, including two work-term project full courses, Engineering 97.591. This program is conducted jointly with firms and laboratories in the Ottawa area who "sponsor" the student, and with whom he/she carries out work-term projects. To participate in the program, the student must gain acceptance of both the Department of Electronics and the sponsoring organization.

Doctor of Philosophy

Admission and program requirements for the Ph.D. degree are outlined in the Faculty of Engineering section of this calendar.

Graduate Courses*

- Engineering 97.541W1

Solar Electricity Generation

This course gives a comparative study of devices and techniques for the generation of solar electricity. Topics covered will include the basics of solar energy (solar spectrum, insolation, etc.); photovoltaics, with emphasis on silicon solar cells; photovoltaic arrays and systems; concentration; solar thermal electricity; thermoelectricity; windmills; tidal power; comparison with conventional hydro, coal, oil, and nuclear generating stations. The economics of solar energy and the prognosis for the future will also be discussed.

Edward Norman.

- Engineering 97.551F1

Passive Microwave Circuits

Circuit aspects of passive microwave components and systems, with emphasis on concepts employed in the design and use of passive microwave devices. Review of EM theory, transmission lines, and waveguides. Microwave network analysis. Scattering-matrix characterization of reciprocal microwave junctions and discontinuities. Ferrites, nonrecriprocal junctions, isolators, and circulators. Design, characteristics, and use of microwave components, such as transformers, filters, hybrids, tuners, and directional couplers, with particular emphasis on their realization in stripline and microstrip integrated circuits.

B.A. Syrett.

- Engineering 97.555F1

Passive Circuit Theory

General description of networks, leading to matrix representation of n-terminal lumped and distributed networks. Elements of matrix algebra as applied to networks. Properties of network functions; poles and zeros of driving point and transfer functions. Foster and Cauer canonic forms. Syn-

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

thesis of lossless two-ports, single and double-terminated. Modern filter theory; approximation of characteristics by rational functions; Butterworth and Chebyshev approximations.
P.D. van der Puije.

• Engineering 97.557W1
Active Circuit Theory
Characterization of negative resistance one-port networks; signal generation and amplification. Active two-ports; y, z, h, k, chain and scattering parameters. Measurement of two-port parameters. Activity and passivity; reciprocity, non-reciprocity, and anti-reciprocity. Gyrator as a circuit element. Stability, inherent and conditional; power gain of conjugate and mismatched two-port amplifiers. Amplifier gain sensitivity. Oscillators, maximal loading, and frequency sensitivity. Active filter design; gyrator, negative immittance converter (NIC) and operational amplifier used as functional elements. Practical realization of gyrators and NICs. Active network synthesis.
Prerequisite: Engineering 97.555 or equivalent.
P.D. van der Puije.

• Engineering 97.559F1
Integrated Circuit Technology
Processes used for the fabrication of LSI and VLSI silicon integrated circuits, and methods used for the evaluation and characterization of processes and devices: silicon properties, thermal oxidation, solid-state diffusion, ion-implantation, defect mechanisms, optical and electron-beam lithography, chemical and plasma (dry) etching, chemical vapour deposition, metallization, materials and device characterization, device design limitations and reliability considerations, failure mechanisms. Direction of technology for VHSIC and VLSI.
T.F. Unter.

• Engineering 97.562F1
Microwave Solid State Electronics
Discussion of basic principles of operation of varactor diodes, parametric amplifiers, p-i-n diodes, microwave switches, limiters, and phase shifters. Schottky barrier devices, detector and mixer circuits. Avalanche transit-time microwave diodes, bulk gallium arsenide devices, microwave transistors, applications.
B.A. Syrett.

• Engineering 97.563W1
Communications Technology
This course introduces the student to the technology of communication systems showing the fundamental and implementation limitations of modern systems, such as high-capacity digital radio, spread spectrum, analog mobile radio and cable systems. Topics discussed in the course include non-ideal fading channels, noise theory, nonlinearities, and filter technology. The above topics are related to several modern operating systems, such as the North American long haul digital radio system, and the Japanese advanced mobile radio system.
D.R. Conn.

• Engineering 97.565W1
Fiber-Optical Communications
Transmission characteristics of optical waveguides; electroluminescent sources, such as light-emitting diodes, gallium arsenide lasers, and gas lasers; photo-diodes, avalanche detectors; external beam modulators; repeater design; coupling devices for fibers; noise generation and measurements; intermodulation, crossmodulation, and nonlinearity characterization; analog systems, digital systems, system design accounting for component signal degradation; free space links; data bus systems; introduction to integrated optics.
J.C. Dyment, Jan Conradi, David Kahn, and Richard Lowe.

• Engineering 97.566W1
Communication Circuits
Phase-locked loop characteristics, such as stability, noise performance, tracking, acquisition, and optimization. Phase-locked loop applications, such as phase-locked receivers, modulators, demodulators, oscillators, synthesizers, and data synchronizers.
J.S. Wight.

• Engineering 97.567F1
Antenna and Array Engineering
Design parameters, such as power pattern, radiation intensity, directivity, gain, beam area, radiation resistance. Structures, such as infinitesimal linear element, thin linear antenna, rhombic, log periodic, loop, helical, slot, microstrip, horn, and reflector antennas. Baluns, feeders, masts. Receiving antennas. Aperture fundamentals, sampled aperture. Array fundamentals, periodic,

Chebyshev, aperiodic, and random arrays. Adaptive beam forming.
J.S. Wight.

• Engineering 97.568W1
Electronic Measurements and Instrumentation
Measurement of basic electronic circuit and system quantities in the band 30 kHz - 30 GHz: frequency, voltage, current, impedance, phase, circuit Q, power, gain, attenuation, dynamic range, distortion, sensitivity, SNR and BER. Instrumentation discussed will include signal generators, detectors, general- and special-purpose oscilloscopes, RF bridges, frequency counters, voltmeters, spectrum analyzers, network analyzers, TDR and automated measurement systems.
B.A. Syrett.

• Engineering 97.569W1
Nonlinear Microwave Devices and Effects
Construction of nonlinear microwave devices, their application in practical networks, and the mathematical treatment of their consequent behaviour. Nonlinear-resistance devices: power detectors, mixers, and frequency multipliers. Nonlinear-reactance devices: varactors; parametric circuits for frequency-multiplication, mixing and frequency-division; voltage-controlled oscillators. Intentionally nonlinear amplifiers, including class C and class L modes of operation. Effects of undesirable amplifier nonlinearity: intermodulation distortion, amplitude and phase nonlinearity, AM-to-PM conversion, cross-modulation.
R.G. Harrison.

• Engineering 97.580F1
Theory of Semiconductor Devices
Review of solid state physics underlying device mechanisms. Equilibrium and non-equilibrium conditions in a semiconductor. Physical theory of basic semiconductor device structures and aspects of design: PN junctions and bipolar transistors; field effect devices. Basic current transport relationships. Charge control theory. Modelling of device mechanisms. Performance limitations of transistors.
A.R. Boothroyd.

• Engineering 97.581F1
Electronic Circuit Reliability
Basic considerations in electronic circuit reliability, with particular reference to integrated circuits. Introduction to reliability statistics. Probability density distribution functions (for example, Gaussian, Log normal, Weibull, etc.). Failure analysis. Determination of confidence limits, risk, MTFB, MTTF, estimators and Bathtub Curve. Reliability assurance. Reliability physics. Failure causes, modes and mechanisms in semiconductor devices and ICs. Reaction kinetics (the Arrhenius relationship). Reliability testing of ICs. Environmental screen tests. Burn-in. Life tests, electrical testing. Functional testing. Cost considerations. Advanced failure analysis tests (for example, SEM, X-ray, microprobe, ion probe). Semiconductor test structures. Selected examples. Special emphasis on LSI systems.
D.V. Sulway.

• Engineering 97.582W1
Surface-Controlled Semiconductor Devices
Review of the theory of semiconductor surfaces and interfaces. Surface state measurement techniques. Study of surface-dependent devices on silicon: MOS capacitors and FETs; gate-controlled diodes; charge-transfer devices (CCD's); NMOS and related memory elements, Schottky barriers and MIS tunnel junctions. Surface effects in shallow junctions and lateral bipolar transistors. MISFETs on III-V substrates.
Prerequisite: Engineering 97.580 or equivalent.
N.G. Tarr.

• Engineering 97.584F1
Integrated Circuit Engineering I
Overview of the integrated circuit design process, touching on each of the major tasks: survey of MOS and CMOS LSI/VLSI technologies; design rules and layout; review of basic circuits — inverters, logic gates, transmission gates, op-amps; static and dynamic MOS logic; latchup in CMOS; circuit modelling and simulation using SPICE. The course will include a design exercise of a mixed analog and digital LSI integrated circuit.
M.A. Copeland.

• Engineering 97.585W1
Integrated Circuit Engineering II
An integrated circuit design course based on the MEAD-CONWAY approach, with increased concentration on the details of digital design at the gate level, supported by computer simulation with SPICE. CMOS design will be included. Students

will do IC projects which include computer-aided layout in the MEAD-CONWAY CIF format, with the possibility that suitable projects will actually be fabricated.
M.A. Copeland.

• Engineering 97.586F1
Computer-Aided Circuit Design
The application of computer methods in circuit analysis and design. Analog circuit analysis programs. Computer-aided placement and circuit layout. Logic level simulation; circuit delay, hazard detection. Computer-aided testing, fault simulation. Test sequence generation, fault tolerance. A brief overview of analog fault simulation will be given.
J.P. Knight and P.D. van der Puije.

• Engineering 97.587W1
Microprocessor Electronics
This is a course for graduate engineers who are familiar with one or more of the common eight-bit microprocessors. Topics such as bit-sliced machines, innovative modern microprocessors, special purpose peripheral chips, dynamic memory design, CCD and bubble memories, interfacing techniques, and timing problems will be covered. Fabrication technology as it affects cost and performance will be discussed.
J.P. Knight.

• Engineering 97.588F1
Signal Processing Electronics
CCDs, BBDs, transversal filters, recursive filters, switched capacitor filters, design of op-amps in IC technology, Z domain analysis of filters to meet specifications, interfacing aspects between analog and digital, Antialias filtering, A/D and D/A converters, CODECS. Noise in sampled analog circuits, dynamic range, signal to noise ratio. Computer simulation of sampled analog circuits, with assignments in FORTRAN. Tradeoffs between sampled analog and digital approaches to signal processing.
M.A. Copeland.

• Engineering 97.589F1, W1
Advanced Topics in Electronics
A course dealing with selected advanced topics of recent interest in the broad field of solid state devices, electronic circuits, and electromagnetics. Specified topics to be announced each year. Course usually given on a seminar basis with students' presentations on assigned topics.

• Engineering 97.590F1, W1, S1
Engineering Project I
A one-term course, carrying half-course credit, for students pursuing the course work M.Eng. program. An engineering study, analysis and/or design project under the supervision of a faculty member. Results will be given in the form of a written report and presented orally. This course may be repeated for credit.

• Engineering 97.591F2, W2, S2
Engineering Project II
A one-term course, carrying full-course credit, for students pursuing the course work M. Eng. program or the co-operative M.Eng. program. An engineering study, analysis and/or design project under the supervision of a faculty member. Results will be given in the form of a written report and presented orally. This course may be repeated for credit.

• Engineering 97.596F1, W1, S1
Directed Studies
Various possibilities exist for pursuing directed studies on topics approved by a course supervisor, including the above listed course topics where they are not offered on a formal basis.

• Engineering 97.599F3, W3, S3
M.Eng. Thesis

• Engineering 97.699F, W, S
Ph.D. Thesis

Department of Mechanical and Aeronautical Engineering

The Department

Chairman of the Department: H.I.H. Saravanamuttoo
Departmental Supervisor of Graduate Studies: M.J. Bibby

The Department of Mechanical and Aeronautical Engineering offers programs of study and research leading to M.Eng. degrees in Aeronautical Engineering, Materials Engineering, and Mechanical Engineering, and to Ph.D. degrees in Aeronautical and Mechanical Engineering. The M.Eng. degree can be earned by a combination of course work and thesis or by course work alone.

Programs of research and study are offered in several areas:

- Aerodynamics
- Internal Gas Dynamics
- Heat Transfer
- Stress and Failure Analysis
- Vibration Analysis
- Computer-Aided Engineering
- Computer-Aided Design
- Robotics
- Vehicle (Performance and Safety) Engineering
- Nuclear Engineering
- Energy Systems Planning
- Energy Conversion and Utilization
- Manufacturing Engineering
- Materials Engineering

The department has a major research commitment, both analytical and experimental, to thermofluid-dynamic and mechanical problems of gas turbine engine design and operation. Current projects include flow prediction and analysis in turbomachines; two- and three-dimensional boundary layer behaviour; dynamics of gas turbine power plants; design and performance of highly loaded turbines; noise generation in fans, compressors, and turbines; noise propagation in acoustically treated ducts; stress, deformation, and vibration of compressor and turbine blades and discs; optimum design of blades and discs; finite element analysis; dynamics of high-speed rotors; electron beam welding of refractory metals; failure modes of materials in extreme environments.

Another area of intense research effort in the department is computer-aided engineering. Activities in this field include computer-aided analysis (primarily the finite element method), computer-aided design and computer-aided manufacturing. Finite element projects include heat and fluid flow analyses, stress, deformation (manufacturing processes), vibration and fracture mechanics studies. Computer-aided engineering is well supported with a large Honeywell central facility, minicomputer, microprocessor equipment and relatively extensive graphics facilities.

As part of the faculty interest in transportation, the department is active in research on air and ground vehicle technology. Current studies include computational methods for steady and unsteady potential flows over complex configurations; aircraft noise; boundary layer separation and control; model simulation of snow drifting on airports and roadways. The Transport Technology Research Laboratory has been organized for ground transport studies: design and optimization of off-road vehicles; vehicle safety; anti-lock braking systems; vehicle-terrain interaction; effect of vibration on vehicle performance; dynamics of air-cushion and magnetically levitated vehicles; composite and structural elements.

Members of the department provide the nucleus of Carleton University's Energy Research Group, which is engaged in interdisciplinary studies on the effectiveness of energy utilization in industrialized societies. In particular, studies are in progress on energy utilization in transportation, in buildings, and in industry. Research is being undertaken on the heat transfer and fluid flow aspects of CANDU power reactors — in particular, the thermohydraulic problems of reactor safety. A related interest in the department is in air- and water-pollution problems associated with energy utilization. Research on coal gasification is also in progress.

Another area of interest is in design, and manufacturing and materials technology; in particular, there are programs on the properties of welded joints, heat treatment and forming studies. The Centre for Advanced Engineering and Design has been established to provide an opportunity for the academic design community to interact with Canadian industry. Graduate studies and programs may be arranged in this area.

The departmental laboratories are well equipped for the various research activities described above, and these are supported by a machine shop and

an electronics shop. In addition to the extensive laboratory facilities, the faculty maintains several small computers. The University's central computing facility is based on a twin Sigma 9 computer and a Honeywell Level 66 computer; this facility is used for major computations and is accessible at a large number of remote terminals in the Mackenzie Building.

The extensive laboratory facilities of the National Research Council, and of the Department of Energy, Mines and Resources are also used, by special arrangement, for research and graduate studies of mutual interest. Strong contacts are maintained with the gas turbine and nuclear power industries.

Master of Engineering

Admission Requirements

The normal requirements for admission to the master's program are outlined in the Faculty of Engineering and general sections of this calendar.

Program Requirements

M.Eng. by Thesis

- Six half-courses and a thesis

M.Eng. by Course Work

- 12 half-courses, which must include the independent study course Engineering 88.598, and at least one full course or equivalent in an area of engineering outside the main field of study.

Doctor of Philosophy

Admission Requirements

Admission and program requirements for the Ph.D. degree are outlined in the Faculty of Engineering section of this calendar.

Graduate Courses*

- Engineering 88.500F1

Fundamental Fluid Dynamics
Differential equations of fluid motion. Subsonic flow: potential flow theory; outline of panel methods and flows over wings and bodies. Supersonic flow: oblique shock waves and Prandtl-Meyer expansions; flows over wings and bodies. Viscous flow: the boundary-layer approximation; outline of boundary-layer calculation methods; coupling of viscous and inviscid regions of flow.
S.A. Sjolander.

- Engineering 88.501W1

Theory of Viscous and Turbulent Flows
Navier-Stokes and boundary layer equations; mean flow equations for turbulent kinetic energy; integral formulations. Stability, transition, turbulence, Reynolds stresses; separation. Calculation methods, closure schemes. Compressibility, heat transfer, and three-dimensional effects.
S.A. Sjolander.

- Engineering 88.503F1

Incompressible Non-Viscous Flow
The fundamental equations for non-viscous fluid flow; solution of two-dimensional and axisymmetric potential flows; low-speed airfoil and cascade theory; wing lifting-line theory.
R.J. Kind.

- Engineering 88.504F1

Compressible Non-Viscous Flow
Steady isentropic, frictional, and diabatic flow; shock waves; irrotational compressible flow, small perturbation theory and similarity rules; second-order theory, unsteady, one-dimensional flow.
A.N. Abdelhamid.

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

• Engineering 88.506F1
Theory of Subsonic Flows
Integral formulation of the basic equations of gas dynamics. Boundary conditions for moving surfaces, including surfaces of discontinuity. Regular and singular perturbation problems, with applications to airfoil theory and viscous flow theory. Linearized subsonic theory with applications to flows about wings and slender bodies. Hodograph methods and higher order theories of compressible subsonic flow.
Prerequisite: Mathematics 70.446 or permission of the department.
(Also offered as Mathematics 70.543)

• Engineering 88.507W1
Theory of Supersonic Flows
The theory of characteristics derived by matrix methods. Applications to one-dimensional unsteady and two-dimensional steady supersonic flows. Wave propagation in shock tubes. Rarefaction and compression waves. Riemann invariants and wave interaction problems. Structure of a shock front. Supersonic sources with applications to wings and bodies. Supersonic flow about oscillating airfoils.
Prerequisite: Mathematics 70.446 or permission of the department.
(Also offered as Mathematics 70.544)

• Engineering 88.511F1
Speed Flight
Brief review of static stability theory. Euler's equations for rigid body motion; the linearized equations of motion; stability derivatives and their estimation. Longitudinal and lateral dynamic response of an aircraft to control and disturbance.
L.T. Filotas.

• Engineering 88.514F1
Ground Transportation Systems and Vehicles
Performance characteristics, handling and directional stability, ride comfort and safety of various types of ground-vehicle systems, including road vehicles, terrain-vehicle systems, guided transport systems, and advanced ground transport technology.
J.Y. Wong.

• Engineering 88.517W1
Experimental Stress Analysis
Introduction to theory of elasticity. Photoelasticity: types of polariscope, two- and three-dimensional stress fields, frozen patterns. Photoelastic coatings. Strain gauges; gauge factors sensitivity, calibration, and temperature compensation. Moire fringes, brittle lacquers, mechanical strain gauges.
Robert Bell.

• Engineering 88.541W1
Turbomachinery
This course deals with the generalized performance of turbomachinery, and with the thermo- and aerodynamic design of axial and radial flow machines. The emphasis is on compressible flow machines.
R.J. Kind.

• Engineering 88.542W1
Gas Turbines
Interrelationship among thermodynamic, aerodynamic, and mechanical design. Ideal and real cycle calculations. Cycle optimization; turboshaft, turbojet, turbofan. Component performance. Off-design performance; matching of compressor, turbine, nozzle. Twin-spool matching.
H.I.H. Saravanamuttoo.

• Engineering 88.543F1
Advanced Thermodynamics
The course covers three major topics: review of fundamentals from a consistent viewpoint, properties and equations of state, and applications and special topics. The third topic includes an introduction to statistical thermodynamics.
E.G. Plett.

• Engineering 88.547F1
Conductive and Radiative Heat Transfer
Analytical, numerical, and analog solutions to steady-state and transient conduction heat transfer in multi-dimensional systems. Radiative heat exchange between black, gray, non-gray diffusive, and specular surfaces, including effects of athermanous media.
E.G. Plett.

• Engineering 88.550F1
Advanced Vibration Analysis
General theory of discrete multi-degree-of-freedom vibrating systems. Emphasis on numerical techniques of solving complex vibrating systems, with selected applications from aeronautical, civil, and mechanical engineering.
James Kirkhope.

• Engineering 88.561W1
Design Theory and Practice (Creative Problem Solving)
This course outlines problem-solving processes and how they can be applied in engineering design. The student will be introduced to and be expected to practice various systematic and creative problem-solving techniques. The emphasis is on the student's learning methodologies rather than accumulating information. The techniques may be successfully applied in any engineering specialty.
Geza Kardos.

• Engineering 88.562F1
Failure Prevention (Fracture Mechanics and Fatigue)
The course deals with the design of engineering structures to ensure against failure due to fatigue or brittle fracture. It emphasizes an understanding of the nature of fatigue and brittle fracture, and thereby the selection of suitable material, geometry, and inspection procedures for the load and environmental condition intended.
Geza Kardos.

• Engineering 88.565F1
Finite Element Analysis I
An introduction to the finite element methodology, with emphasis on applications to heat transfer, stress analysis, and fluid flow. The basic concepts of Galerkin's method, interpolation, numerical integration, and isoparametric elements are taught using simple examples.
John Goldak.

• Engineering 88.566W1
Finite Element Analysis II
Time marching heat flow problems with linear and nonlinear analysis. Static plasticity. Time-dependent deformation problems; viscoplasticity, viscoelasticity, and dynamic analysis. Isoparametric elements and numerical integration are used throughout.
John Goldak.

• Engineering 88.568W1
Deformation of Materials
A general course for mechanical and civil engineers, dealing with the metallurgical and materials principles that control the mechanical properties and deformation of materials. Topics to be covered include elasticity, anelasticity, yield point phenomena, plastic flow, strain hardening, Bauschinger effect, fracture, viscoelastic deformation.
M.J. Bibby.

• Engineering 88.570T1
Special Topics in Mechanical and Aeronautical Engineering
Courses in special topics related to mechanical engineering and aeronautical engineering, not covered by other graduate courses; course details will be available prior to registration.

Topics for 1982-83

• The Boundary Integral Equation (BIE) Method
Introduction to integral equation. Potential theory: Dirichlet and Neumann problems in engineering practice. Two-dimensional BIE for harmonic problems. Constant line elements. Numerical treatment of BIE. Two-dimensional BIE for electrostatics. Isoparametric line elements. Numerical treatment of BIE and integration schemes. Use of BIE computer programs for solving problems in electrostatics and potential theory.
C.L. Tan.

• Engineering 88.596F1, W1, S1
Directed Studies

• Engineering 88.598F2, W2, S2
Independent Engineering Study
In this course, the student pursuing a master's degree by course work will carry out an independent study, analysis, and solution of an engineering problem or design project. The results will be given in the form of a written report and presented at a departmental seminar. The study will be carried out under the general direction of a faculty member.
M.J. Bibby and others.

• Engineering 88.599F3, W3, S3
M.Eng. Thesis

• Engineering 88.699F, W, S
Ph.D. Thesis

Courses Not Offered in 1983-84

88.508 Experimental Methods in Fluid Mechanics
88.509 Environmental Fluid Mechanics Relating to Energy Utilization
88.510 Performance and Economics of V/STOL Aircraft
88.521 Methods of Energy Conversion
88.530 Acoustics and Noise
88.531 Aero-Acoustics
88.548 Convective Heat and Mass Transfer
88.549 Two-Phase Flow and Heat Transfer

Other Courses of Particular Interest

Civil Engineering
82.511 Introductory Elasticity
82.512 Advanced Elasticity
82.513 Finite Element Methods in Stress Analysis
88.524 Behaviour of Steel Structures
82.534 Intercity Transportation, Planning, and Management

Systems and Computer Engineering
94.501 Simulation and Modelling
94.504 Computer Methods in Industrial Engineering
94.505 Optimization Theory and Methods
94.552 Advanced Linear Systems
94.553 Stochastic Processes

Physics
75.511 Classical Mechanics and Theory of Fields
75.447 Statistical Physics (Statistical Thermodynamics)

Mathematics and Statistics
70.446 Hydrodynamics and Elasticity
70.486 Numerical Analysis
70.586 Numerical Analysis

Department of Mechanical Engineering, University of Ottawa
All courses listed in the mechanical engineering section of the University of Ottawa calendar.

Department of Systems and Computer Engineering

The Department

Chairman of the Department: Bernard Pagurek
Departmental Supervisor of Graduate Studies: S.A. Mahmoud

The Department of Systems and Computer Engineering offers programs of study and research leading to the M.Eng. and Ph.D. degrees in Electrical Engineering.

A program leading to the M.Sc. degree in Information and Systems Science is offered in cooperation with the Department of Mathematics and Statistics. In addition, a program leading to the M.C.S. degree in Computer Science is offered jointly with the School of Computer Science, the Department of Mathematics and Statistics, and the Department of Computer Science at the University of Ottawa.

The departmental program centers upon the analysis and design of systems whose primary function is the processing of information. Within this context, four interrelated areas of study receive major attention:

- Computer Communications and Database Systems
- Communications and Signal Processing
- Computer Systems Engineering
- Modelling, Simulation, Optimization and Control

An integrated course program provides students with the fundamental basics, and allows specialization in one or more of the above areas as desired. The research program emphasizes the development and application of modern methods of information systems engineering pertinent to these areas. Work undertaken includes both theoretical studies and the related problems of practicable realizations. Specific research topics are often associated with one or more major projects, such as the Microprocessor Systems Development Laboratory.

Computing systems play a central role in the research and teaching activities of the department. The facilities available to the student include interactive time-sharing and remote batch terminals linked to the University's Honeywell Level 66 digital computer and several small- to medium-sized computers available within the department. These include a PDP-11/55, PDP-11/60, GT-44, and GT-40 computer, all with graphics capability. The department is installing a local area computer network linking a number of microprocessors. Applications include information storage and retrieval, communications, signal processing, computer system design, and studies of office automation.

Full advantage is taken within the department of the technology-oriented government/industry/university complex in the Ottawa area. Co-operative projects exist with the Department of Communications, Communications Research Centre, NRC, Bell Northern Research Laboratories, Transport Canada, and Gandalf.

Students wishing to pursue a computing specialization in systems engineering may be required to take appropriate undergraduate computing science courses for which credit may be allowed.

Master of Engineering

Admission Requirements

The normal requirements for admission to the master's program are outlined in the Faculty of Engineering and general sections of this calendar.

Program Requirements

M.Eng. by Thesis

- Six half-courses and a thesis

M.Eng. by Course Work

- 12 half-courses, including a project course: Engineering 94.590, or 94.591, or 94.592

M.Eng. Co-operative Program

- 12 half-courses, including two work-term projects, each carrying one full-course credit; no thesis. This program is conducted jointly with firms and laboratories in the Ottawa area who "sponsor" the student, and with whom he/she carries out his/her work-term projects. To participate in the program, the student must gain acceptance of both the Department of Systems and Computer Engineering and the sponsoring organization.

Certain courses are fundamental to advanced study in the various departmental areas of specialization. These are Engineering 94.552, 94.553,

94.557, and 94.574. All M.Eng. students in systems engineering must complete at least two of these (but may complete more than two if they wish). The department may waive this requirement for individual students on the basis of previous studies or equivalent experience. The most suitable combination of these core courses should be chosen by the student in consultation with his/her program adviser at the time of initial registration.

M.Sc. Program in Information and Systems Science

This program is administered jointly by the Department of Mathematics and Statistics and the Department of Systems and Computer Engineering, and leads to an M.Sc. (Information and Systems Science). Intended primarily for students whose first degree is not in electrical engineering, it allows candidates to pursue studies in information systems engineering, communications and signal processing, computing science, or mathematical systems theory.

Applicants who desire admission to the information and systems science program are required to have an honours degree in a related discipline, with at least three years of mathematics and a strong undergraduate preparation in computer science; otherwise the general regulations apply. The normal program consists of eight half-courses, of which two must be taken in the Department of Mathematics and Statistics, and a thesis.

The program is more fully described on page 125 of this calendar.

Master of Computer Science

The Master of Computer Science (M.C.S.) degree program is offered by the School of Computer Science, the Department of Systems and Computer Engineering, and the Department of Mathematics and Statistics. The program is offered jointly with the Department of Computer Science at the University of Ottawa; hence students are also able to take courses offered there.

Applicants to the M.C.S. program are required to have an honours degree in computer science (or the equivalent). The program is fully described, with a list of courses, on page 141 of this calendar.

Doctor of Philosophy

Admission and program requirements for the Ph.D. degree are outlined in the Faculty of Engineering section of this calendar.

Graduate Courses*

• Engineering 94.501W1
Simulation and Modelling
Simulation of continuous and discrete processes, with emphasis on the latter. Model building. Continuous time systems: analog models, digital approximations; continuous simulation languages. Simulation of discrete event-oriented processes. Specialized simulation languages: GPSS, SIMSCRIPT, GASP, SIMPAC. Monte Carlo methods. Experimental design and statistical analysis of results.
C.M. Woodside.

• Engineering 94.504F1
Computer Methods in Industrial Engineering
Linear programming; simplex and revised simplex methods; duality and post-optimal analysis; applications in health care delivery; integer programming; network models and algorithms, shortest path and minimum cost flow problems; application to computer communication network routing problems and urban traffic problems; equilibrium traffic assignment, Wardrop's conditions; critical path methods.
Bernard Pagurek.

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Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

• Engineering 94.505W1
Optimization Theory and Methods
A second-level course in optimization theory and computer-oriented optimization methods. Lagrange's method of undetermined multipliers. Unconstrained optimization: steepest-descent, Newton-Raphson, conjugate gradient, variable metric, and Powell-Zangwill methods. Nonlinear programming: Kuhn-Tucker conditions, saddle point theory and dual problems, computational techniques. Application to nonlinear engineering system identification, network synthesis problems, filter design. Function space techniques and introduction to optimal control.
Bernard Pagurek.

• Engineering 94/95.507W1
Expert Systems
Expert systems is a special field of artificial intelligence dealing with the design and construction of programs that provide information at the level of an "expert" in a specific area of interest. The existing expert systems and the current research in this area will be surveyed. Typical expert systems deal with medical diagnosis, computer system configuring, and programmer's assistants. Moreover, the systems are generally implemented using one of two paradigms: the rule-based approach or the actor-based approach. Both approaches will be considered in depth. Protoype software implementations are expected. Students will be expected to have a strong programming background, and to be able to familiarize themselves with LISP within the first week should they not already know it.
W.R. LaLonde.

• Engineering 94.511W1
Computer System Design for Performance
Methods for deriving quantitative design parameters within an architectural and configuration framework to meet design requirements on performance parameters, such as the throughput capability or response time of a system. Applications to embedded systems (signal processors, switches, etc.), multi-user systems, and tightly and loosely coupled distributed processors.
Prerequisites: Engineering 94.553, and 94.574 or equivalent, and a course in computer architecture.
C.M. Woodside.

• Engineering 94.517W1
Queueing, Scheduling, and Control of Information Systems
Methods for analyzing contention for resources, and the queue disciplines, priorities, and schedulers used for resolving contention. Emphasis is on applicable results, with approximations for complex cases. Markovian analysis of standard simpler single queues and networks, including embedded processes. Networks of queues: product form, mean value analysis, computation, extended product form, Norton's theorem, asymptotic analysis. Scheduling, priority queues, and real-time control; design of queues.
Prerequisite: Engineering 94.553 or equivalent.
C.M. Woodside.

• Engineering 94.518W1
Topics in Information Systems
This course is designed to introduce the research student to recent developments in information systems design.
Prerequisite: Engineering 94.574 or permission of the department.

• Engineering 94.519W1
Teletraffic Engineering
Congestion phenomena in telephone systems, and related telecommunications networks and systems, with an emphasis on the problems, notation, terminology, and typical switching systems and networks of the operating telephone companies. Analytical queueing models and applications to these systems.
Prerequisite: Engineering 94.553 or the equivalent.

• Engineering 94.521F1
Computer Communication
Components and structure of computer networks, communications subnetwork: physical, data link, and network level protocols, circuit, message, and packet switching. Examples of public data networks. Network performance analysis: queueing, concentration, routing and buffering. Topological design, capacity assignment, and network traffic management.
Prerequisite: Engineering 94.553 (may be taken concurrently).
J.S. Riordon.

• Engineering 94.527W1
Distributed Processing Systems
Distributed processing systems definitions, objectives and applications. Protocols: theory and practical limitations, protocol specification and validation techniques. Layered protocol approach. ISO protocol model, session, presentation and application levels. Design examples: interprocess communications, file transfer and distributed databases. Recovery of distributed systems from failure conditions.
Prerequisite: Engineering 94.521.
S.A. Mahmoud.

• Engineering 94.531F1
System Design with ADA
Requirements of a system design language; relevant features and overview of ADA; use of ADA for logical design, with examples from intelligent terminal system, communication protocol systems; techniques, issues, and guidelines for logical design arising from the examples; mapping the logical design onto the target system; target system performance issues and their implications for the logical design; software/hardware tradeoffs in the target system; implementation issues.
Prerequisite: Engineering 94.574 or equivalent.
R.J.A. Buhr.

• Engineering 94.532F1
Systems Engineering Using VLSI Components
A comprehensive design methodology for implementing systems using VLSI components is expounded and illustrated. It establishes and illustrates this using digital signal processing as a case study. The first part of the course establishes the overall methodology, and places it in perspective with many existing approaches. It then systematically illustrates each step from user requirements, to logical design, to algorithm partitioning and architectural allocation. Examples include designs using existing components, as well as considerations for user-defined chips.
Prerequisite: Engineering 94.558 (or equivalent) and 94.531.
B.A. Bowen.

• Engineering 94.533W1
Digital Systems Engineering
This course is concerned with the totality of activity involved in creation of a digital system. It includes as components both hardware and software engineering, and extends these disciplines to an overall system. Topics include system design methodologies and strategies; representation and discipline mechanisms; constraints; reporting and documentation; interface to manufacturing; quality assurance and maintenance; design reviews; sub-specifications of software and hardware, and their integration and control. Examples are drawn from areas such as signal processing, computer communications, and intelligent terminals.
Prerequisites: Engineering 94.531 and 94.532.
B.A. Bowen.

• Engineering 94.534F1
Mini-Micro Applications
This course covers logical design of systems of sequential and concurrent programs for special-purpose applications of mini- and microprocessors. Intelligent terminal applications are particularly emphasized. Topics covered include virtual terminals; command decoders; device-independent I/O handlers; high-level communication protocols office automation functions; and human interface considerations.
Prerequisites: Engineering 94.571 and 94.527.
R.J.A. Buhr.

• Engineering 94.539F1, W1
Advanced Topics in Digital Systems Design
A course dealing with recent and advanced topics in the field of digital systems design and related areas. Students registered in the course are expected to present one or more lectures or seminars on assigned topics.
Prerequisites: Engineering 94.557, 94.558, and permission of the department.
B.A. Bowen.

• Engineering 94.540F1
Topics in Office Automation
Course material is presented from three points of view: the technology, the individual user, and the organization. It demonstrates that successful approaches to office automation must take all three factors into account. Statistics and models of the office and associated markets: trends in technology, selected technologies, their roles, implications, and limitations. Human-machine interaction; what to look for, and what to design into machines for the office. Technology and the organization;

productivity and quality of working life. Students will be required to undertake a substantial project either individually or in groups as part of the course.
Prerequisite: Permission of the department. Students should have prior knowledge of computers and their uses.
A.R. Kaye.

• Engineering 94.551W1
Estimation and Detection
Models for time series analysis: autogressive, moving average processes; decision theory: hypothesis testing, likelihood ratio tests; minimum risk, maximum likelihood, and Bayesian estimators; estimation of parameters of time series models, least squares and maximum likelihood, recursive techniques, on-line system identification for process control; Wiener-Kalman filters.
Prerequisite: Engineering 94.552 and 94.553.
Bernard Pagurek.

• Engineering 94.552F1
Advanced Linear Systems
Review of basic linear systems: input-output relations, superposition, impulse response, convolution. Transform methods in systems analysis. Fourier and Laplace transforms. Time-frequency relationships. Discrete time systems, the Z transform. State space representation of the systems: basic concepts, canonical realizations. Observability and controllability of continuous and discrete time realization. Solution of state equations and modal decomposition. Linear state variable feedback and modal controllability. Abstract approach to state space realization methods. Geometric interpretation of similarity transformations.
A.U.H. Sheikh.

• Engineering 94.553F1, W1
Stochastic Processes
Basic concepts of randomness, as applied to communications, signal processing, and queueing systems; probability theory, random variables, stochastic processes; random signals in linear systems; introduction to decision and estimation; Markov chains and elements of queueing theory.
H.M. Hafez.

• Engineering 94.554F1
Principles of Digital Communication
Digital communication systems: characterization of information and noise signals; source encoding; communication processes; basic decision theory; optimum receivers. System performance; delay distortion, amplitude distortion, intersymbol interference, additive noise. Common digital modulation systems.
Prerequisite: Engineering 94.553 (may be taken concurrently).
H.M. Hafez.

• Engineering 94.557F1
Fundamentals of Discrete Systems
Introduction to the theory and applications of discrete mathematics to the analysis and design of the software and hardware of computers and computing systems. Digital machine theory: group theory and applications to finite state machines; algebras and combinatorial logic design, homomorphic maps and application to group codes; rings and fields and their application to cyclic codes. Graphs: graph and tree structures, directed graphs; applications to reliability, reachability and searches; classes of polynomial complete and incomplete problems with graph representation. Languages and grammars: finite automata, stack structured computers, Polish notation, queueing structures, and grammars.
S.A. Mahmoud.

• Engineering 94.558W1
Digital Systems Architecture
The frontier aspects of computer systems architectures, beginning with a detailed assessment of the currently foreseen changes in semiconductor capabilities. New architectural concepts are explored, and typical machines (for example, VAX 11, HP 3000, IBM 38) are considered as examples. New concepts in controller design and in virtual memory systems are explored in some depth, augmented by design examples. Students are expected to undertake a heavy reading program in the current literature, and to complete several critiques.
Prerequisites: Engineering 94.574 and 94.457 or equivalent.
B.A. Bowen.

• Engineering 94.562W1
Digital Signal Processing
Signal representations, Z transform and difference equations. Digital filters; recursive design

techniques for FIR and IIR filters, quantization effects. Discrete Fourier transform: properties, correlation and convolution, chirp Z transform. Fast Fourier transform: algorithms and implementation. Random signal analysis: estimators, sampling distributions, averaging, correlation and spectral estimates, windowing for leakage suppression and stability improvement. Digital signal processing software: interaction of processor and software architectures, techniques for production of time efficient software. Speech analysis and synthesis, predictive encoding, and other current applications.
Prerequisites: Engineering 94.552 and 94.553 (may be taken concurrently).
L.R. Morris.

• Engineering 94.565W1
Advanced Digital Communication
Review of optimum reception for the non-distorting additive noise channel; intersymbol interference and equalization; efficient digital modulation techniques; timing and synchronization; discussion of selected topics, such as partial response, error detection and correction, multiple-access communication, spread spectrum modulation; information theory.
Prerequisite: Engineering 94.554.
D.D. Falconer.

• Engineering 94.566W1
Multi-Access Communications Systems
Selected topics in multi-user communications systems, such as telecommunications switching and multiplexing; multi-access protocols; local area networks; the integrated switched digital network; TDMA and FDMA satellite systems, packet and mobile radio systems; spread spectrum communication techniques; digital communication on optical fiber, subscriber loop, and CATV channels.
Prerequisites: Engineering 94.554.
D.D. Falconer.

• Engineering 94.567W1
Source Coding and Data Compression
Discrete and continuous sources: the rate distortion functions. Discrete source coding: Huffman coding, run length encoding. Continuous source coding: waveform construction coding; PCM, DPCM, delta modulation; speech compression by parameter extraction; predictive encoding; image coding by transformation and block quantization. Fourier and Walsh transform coding. Compression by tree coding. Applications to telecommunication signals and storage; speech, television, facsimile.
Prerequisites: Engineering 94.552 and 94.553.
H.M. Hafez.

• Engineering 94.568W1
Mobile Communications Systems
Channel characterization: multipath interference, Rayleigh fading, shadowing effects, selective fading, impulsive noise. Diversity techniques. Analog land mobile systems: FM and SSB systems. Digital land mobile systems: bit and block error rates, digital modulation systems, digitized speech signals. Conventional land mobile networks: trunked networks, access schemes. Cellular land mobile systems. Interference analysis for analog and digital systems.
Prerequisite: Engineering 94.554.
A.U.H. Sheikh.

• Engineering 94.571F1
Mini/Microcomputer Operating System Design
Theory and practice of structured real time operating system design. Design using high-level concurrent languages and graphical techniques; operating system kernel (nucleus) organization; mapping the kernel onto low-level software and hardware; implementation of operating systems on different hardware architectures, including multiple processor configurations; conflicting requirements of efficiency, speed, flexibility, modularity; consideration of failure recovery, reliability, integrity, protection; features of standard operating systems (RMS/80, RSX/11 and others). Special purpose operating systems for mini/microcomputers, with examples drawn from systems developed or under development at Carleton, using PDP-11 and INTEL-8080 hardware.
Prerequisites: Engineering 94.303 or 94.461, plus 94.574 (or equivalent).
R.J.A. Buhr.

• Engineering 94.573W1
Integrated Database Systems
Physical and logical storage structures; database architecture; logical models of databases; the relational model; relational algebra and calculus; normal forms. Hierarchical model; IMS as an example. Network model; CODASYL DBTG

approach; EDMS as an example. Design issues in distributed databases. Data server machines in local area networks.
Prerequisite: Engineering 94.574 or equivalent.
Bernard Pagurek.

• Engineering 94.574F1
Elements of Computer Systems
A comprehensive overview of basic topics in computers which many engineering students may not have covered in their undergraduate programs. Subjects to be covered may include the following: system organization and architecture: CPUs, memories, instruction sets, addressing modes, data paths, I/O, etc., in 8085, PDP-11, and 370; microprogramming, machine language and assemblers; data types; data structures: queues, stacks, lists, trees; structured programming techniques and common algorithms; operating systems: components of basic systems; management of cooperating processes. This course is designed for graduate students without extensive undergraduate preparation in computer engineering (or the equivalent experience). Students with the equivalent of a bachelor's degree in electrical engineering (with a computer option), computer engineering, or computing science would normally proceed directly to courses for which Engineering 94.574 is a prerequisite.
Prerequisites: Programming experience in at least one high-level language, preferably PASCAL, and some experience with assembly language programming.
D.C. Coll.

• Engineering 94.575W1
Software Translators and Their Applications
Concepts efficiency, expandability, correctness, and compactness. Application in query and edit systems, intelligent terminals, file translations, the design of input/output specifications. Scanners, finite state machines, grammars, parsers, code generators. A significant project to implement a non-trivial translator will be required, involving complex data structures, searching and sorting, overlaying strategies, error detection and recovery strategies, interfacing with operating systems and human engineering.
Prerequisites: Engineering 94.574, or 94.480 and 94.481 or equivalent.
W.R. LaLonde.

• Engineering 94.576F1
Analytical Performance Models of Computer Systems
Analytical modelling techniques for performance analysis of computing systems. Theoretical techniques covered include single and multiple class queueing network models, together with a treatment of computational techniques, approximations, and limitations. Applications include scheduling, memory management, peripheral devices, databases, multiprocessing, and distributed computing.
Prerequisite: Engineering 94.553.
C.M. Woodside.

• Engineering 94.577W1
Teleprocessing Software Design
Review of basic teleprocessing functions and subsystems: code conversion, line control, error control, synchronization. Teleprocessing devices and networks. Data communications systems and host computer interface configurations. Modular software design for front-end processors, message switches, remote concentrators, and intelligent terminals.
Prerequisite: Engineering 94.574 or equivalent and 94.521.
S.A. Mahmoud.

• Engineering 94.579F1, W1
Advanced Topics in Software Engineering
A course dealing with recent and advanced topics in the field of software engineering and related areas. Primary references are recent publications in the field. Students registered in the course are expected to present one or more lectures or seminars on assigned topics.
Prerequisite: Engineering 94.531 and permission of the department.
R.J.A. Buhr.

• Engineering 94.582W1
Topics in Information and Systems Science
Fundamental results in design and analysis of efficient computer algorithms for large, complex problems. Areas of application include data manipulation, computer networks, queueing systems, and optimization.
(Also offered as Mathematics 70.582)
R.J.A. Buhr and Frantisek Fiala.

• Engineering 94.584F1, W1
Advanced Topics in Communications Systems
Recent and advanced topics in communications systems. Students registered in the course are expected to present one or more lectures or seminars on assigned topics.
Prerequisite: Engineering 94.565 and permission of the department.
D.D. Falconer.

• Engineering 94.589W1
Advanced Topics in Measurements and Models
Recent and advanced topics in optimization, queueing theory, dynamic systems, estimation for systems analysis, the theory of networks, and similar areas. A seminar course for Ph.D. students and (with permission) advanced master's students.
Bernard Pagurek and C.M. Woodside.

• Engineering 94.590F1, W1, S1
Systems Engineering Project
Students pursuing the non-thesis M.Eng. program will conduct an engineering study, analysis, and/or design project under the supervision of a faculty member. Results will be given in the form of a typewritten report and presented at a departmental seminar.

• Engineering 94.591F2, W2, S2
Systems Engineering Project
Project similar to Engineering 94.590, but either of greater scope or longer duration. Results will be given as a typewritten report and presented in a seminar.

• Engineering 94.592T2
Systems Engineering Project
(Same description as Engineering 94.591, but spread over two terms)

• Engineering 94.593F2, W2, S2
Co-operative Program Project
A one-term course, carrying full-course credit, for students pursuing the co-operative M.Eng. program. An engineering study, analysis, and/or design project under the supervision of a faculty member. Results will be given in the form of a written report and presented orally. This course may be repeated for credit.

• Engineering 70/94/95.595F4,W4,S4
M.C.S. Thesis

• Engineering 94.596F1, W1, S1
Directed Studies

• Engineering 70/94.598F3,W3,S3
M.Sc. Thesis in Information and Systems Science

• Engineering 94.599F3, W3, S3
M.Eng. Thesis

• Engineering 94.699F, W, S
Ph.D. Thesis

School of Architecture

The School

Director of the School: to be announced

The School of Architecture does not offer a program at the graduate level. However, it does offer graduate courses, and members of the school participate in graduate programs offered by the Department of Civil Engineering, the Institute of Canadian Studies, the Faculty of Environmental Studies at York University, the Centre for Building Studies at Concordia University, and the Faculté de l'Aménagement at the Université de Montréal. Members of the school also supervise graduate research.

The Architectural Research Group operates within the school to co-ordinate and assist research and consulting activities.

Graduate Courses*

- Architecture 76.500F1, W1
Directed Studies in Canadian Architecture
Reading and research tutorials.

- Architecture 77.500F1, W1
Directed Studies in Building Technology
Reading and research tutorials.

- Architecture 78.500F1, W1
Directed Studies in Urban Planning and Design
Reading and research tutorials.

An honours degree or equivalent qualification in a relevant field, as well as permission of the school, is a required prerequisite for admission to these courses.

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

The Committee

Chairman of the Committee: J.E. Neilson

Supervisors of Graduate Studies in the Co-operating Departments: Frantisek Fiala, School of Computer Science; C.W.L. Garner, Department of Mathematics and Statistics; S.A. Mahmoud, Department of Systems and Computer Engineering

Joint Carleton University/University of Ottawa Program Co-ordinating Committee Chairman: L.G. Birta, Department of Computer Science, University of Ottawa

The M.C.S. program includes graduate study and research leading to the degree of Master of Computer Science. Four broad areas of study are identified as follows:

Programming Systems and Languages
Database systems, operating systems, software methodology, software translators, language design

Theory of Computing
Analysis of algorithms, automata theory, formal languages, complexity, computability, logic and program schemata

Computer Applications
Artificial intelligence, graphics, picture and signal processing, modelling and simulation, numerical analysis, optimization

Computer Systems
Computer architecture, networks and distributed processing, computer communications, mini- and microcomputers

Within these areas, the program emphasizes problems of current practical significance and has close links to the scientific and industrial communities.

The Master of Computer Science program involves several departments at Carleton University and the University of Ottawa, and is a joint program offered by the two universities. Students may include courses from both universities in their programs, but they should apply to the university with which they expect the closer association. A student's program will be administered by the university at which he/she is enrolled, and he/she will be subject to the graduate regulations of that university.

At Carleton University, a student chooses to register in the School of Computer Science, or the Department of Mathematics and Statistics, or the Department of Systems and Computer Engineering. At the University of Ottawa, the program is offered in the Department of Computer Science.

Qualifying-Year Program

Applicants who have a general (pass) bachelor's degree, or who otherwise lack the required undergraduate preparation, may be admitted to a qualifying-year program. Refer to the general section of this calendar for regulations governing the qualifying year.

Master of Computer Science

Admission Requirements

Applicants should have an honours bachelor's degree in computer science or equivalent, with at least high second-class standing. By *equivalent* is meant an honours degree in a program which includes at least six computer science full courses, two of which must be at the fourth-year level, as well as four full courses in mathematics, one of which must be at the third- or fourth-year level. These courses must include the topics indicated below:

Computer Science
Data structures/file management, operating systems, computer architecture, algorithm design and analysis, assembly language and two high-level languages

Mathematics
Calculus, linear algebra, algebraic structures or discrete mathematics, probability and statistics, numerical analysis

Program Requirements

Normally, students in the program will be expected to complete a thesis; however, students who have substantial relevant work experience may be permitted to take the non-thesis option, which must include a graduate research project course. Each candidate submitting a thesis will be required to undertake an oral defence of the thesis.

Students in the thesis option will take six half-courses or equivalent in addition to their thesis work. Students in the non-thesis option will take 10 half-courses. The course selections must be approved by the student's academic adviser, and must include at least

- One half-course in programming systems and languages
- One half-course in the theory of computing
- One half-course in either computer applications or computer systems

Both course and thesis work may be completed either by full-time or part-time study. A candidate may be permitted to carry out thesis work off campus provided that suitable arrangements are made for supervision and experimental work, and prior approval is given by the committee.

Graduate Courses

The courses in the following list are offered by various departments indicated by the prefix of the course code as follows:

Carleton University
70. Department of Mathematics and Statistics
94. Department of Systems and Computer Engineering
95. School of Computer Science

University of Ottawa
CSI Department of Computer Science
ELG Department of Electrical Engineering
MAT Department of Mathematics

Graduate courses at the University of Ottawa normally carry a weight of either two or three credits. A half-course at Carleton University is equivalent to a three-credit course at the University of Ottawa. Thus, for instance, three two-credit courses are counted towards program completion as two half-courses.

Programming Systems and Languages
94.401 Operating Systems
94.480 Introduction to Software Engineering
94.481 Software Engineering Project
94.571 Mini/Microcomputer Operating System Design
94.573 Integrated Database Systems
94.575 Software Translators and Their Applications
94.579 Advanced Topics in Software Engineering
95.404 System Software
95.490 Advanced Topics in Computer Science
95.501 Foundations of Programming Languages
95.502 End-User Facilities
CSI4110 Systems Programming
CSI4115 Introduction to Compilers
CSI5110 Advanced Programming Principles
CSI5115 Database Management Systems
CSI5118 Compiler Design and Optimization
ELG5185 Compiler Techniques

Theory of Computing
70.482 Introduction to Mathematical Logic
70/95.483 Topics in Applied Logic
70/95.484 Design and Analysis of Algorithms
70/95.485 Theory of Automata
70.565 Theory of Automata
70/94.582 Topics in Information and Systems Science
70.584 Topics in Algorithm Design
70.587 Formal Languages and Syntax Analysis
95.504 Topics in Arithmetic Complexity
95.505 Automata Models of Learning Systems
CSI4101 Theory of Automata I
CSI4102 Theory of Automata II
CSI4105 Design and Analysis of Algorithms
CSI5101 Formal Models of Computational Systems
CSI5162 Topics in the Theory of Computing
MAT5165 Algebraic Automata Theory I
MAT5166 Algebraic Automata Theory II

Computer Applications
70/95.486 Numerical Analysis
70.569 Topics in Combinatorial Mathematics
70.581 Linear Optimization
70.583 Nonlinear Optimization

70.584 Topics in Operations Research
70.585 Topics in Algorithm Design
70.586 Numerical Analysis
70.588 Combinatorial Optimization
70.589 Combinatorial Optimization
94.405 Discrete Simulation and its Applications
94.501 Simulation and Modelling
94.504 Computer Methods in Industrial Engineering
94.505 Optimization Theory and Methods
94/95.507 Expert Systems
94.511 Computer System Design for Performance
94.576 Analytical Performance Models of Computer Systems
95.402 Computer Graphics
95.403 Transaction Processing Systems
95.407 Applied Artificial Intelligence
95.590 Selected Topics in Computer Science
CSI4104 Introduction to Artificial Intelligence
CSI4120 Analog Computation
CSI4121 Simulation Techniques for Continuous Systems
CSI4122 Simulation of Discrete-Change Systems
CSI4125 Foundations of Simulation
CSI4133 Computer Methods in Picture Processing
CSI4134 Pattern Recognition Techniques
CSI4530 Graphiques Interactifs
CSI5120 Simulation of Large-Scale Systems
CSI5121 Hybrid Computer Problem Solving
CSI5150 Numerical Optimization Methods
CSI5161 Topics in System Simulation and Optimization
CSI5384 Computer Graphics
ELG5378 Image Processing Techniques
MAT4236 Numerical Methods for Differential Equations
MAT4381 Numerical Linear Algebra I
MAT4382 Numerical Linear Algebra II

Computer Systems
94.457 Introduction to the Architecture of Computer Systems
94.461 Microprocessor Systems
94.519 Teletraffic Engineering
94.521 Computer Communication
94.527 Distributed Processing Systems
94.539 Advanced Topics in Digital Systems Design
94.558 Digital Systems Architecture
94.577 Teleprocessing Software Design
95.503 Principles of Distributed Computing
CSI4114 Microprogramming and Machine Architecture
CSI4132 Real-Time and Data Communications Systems
CSI4331 Advanced Mini- and Microcomputer Systems
CSI5160 Topics in Mini- and Microcomputer Systems
ELG5189 Principles of Microprogramming
ELG5190 Computer Architecture
ELG5191 Principles of Microprocessors
ELG5192 Microprocessor-Based Systems
ELG5193 Multimicroprocessor Systems
ELG5374 Computer Communication Networks
ELG7182 Topics in Computer Architecture

Theses and Projects
70.591 Directed Studies
70.593 Project
94.596 Directed Studies
95.591 Directed Studies
95.592 Project
70/94/95.595 M.C.S. Thesis

Departmental Program Descriptions and Details of Courses

Faculty of Science

Dean: G.B. Skippen

Ottawa-Carleton Centre for Graduate Studies and Research in Biology

The Centre

Director of the Centre: M.B. Fenton
Associate Director: D.L. Brown

Students wishing to pursue studies in biological sciences at the M.Sc. and Ph.D. levels in the Ottawa area do so in a co-operative program that combines the resources of the Departments of Biology of Carleton University and the University of Ottawa. The two universities have a joint committee supervising the programs, regulations, and student admissions.

Students are admitted for graduate work under the general regulations of the centre. Additional criteria for admission include academic performance, research experience, and referees' appraisals. The student must also be accepted by a faculty member who will supervise the research project, and the choice of supervisor will determine the primary campus location of the student. The student's advisory committee will normally include faculty members from both universities.

Requests for information, and completed applications should be sent to the director of graduate studies in biology, Carleton University.

Members of the Centre

J.B. Armstrong, *Biochemical Genetics*
J.T. Arnason, *Plant Science*
C.A. Barlow, *Experimental Ecology*
I.L. Bayly, *Wetland Ecology*
T.W. Betz, *Embryological Endocrinology*
Frédéric Briand, *Community Ecology*
D.L. Brown, *Cell Biology*
G.R. Carmody, *Population Genetics*
B.B. Diena, *Bacteriology*
J.A. Dillon, *Molecular Genetics*
M.B. Fenton, *Behavioural Ecology*
J.C. Fenwick, *Comparative Endocrinology*
D.R. Gardner, *Pesticide/Nerve Interactions*
Roy Greenhalgh, *Environmental Toxicology*
D.A. Hickey, *Population Genetics*
H.F. Howden, *Biogeography, Systematics of Insects*
André Hurst, *Microbiology*
W.I. Illman, *Fungal Systematics*
R.J. Ireland, *Plant Biochemistry*
V.N. Iyer, *Bacterial Genetics*
S.L. Jacobson, *Excitable Cell Physiology*
D.A. Johnson, *Molecular Biology*
K.W. Joy, *Plant Metabolism*
P.A. Keddy, *Plant Ecology*
W.A. Keller, *Plant Tissue Culture*
D.J. Kushner, *Microbiology*
J.D.H. Lambert, *Plant Communities and Man*
P.E. Lee, *Viral Ultrastructure*
L.R. Lefkovitch, *Mathematical Biology*
E.E. Lindquist, *Mite Systematics*
D.E. McAllister, *Fish Systematics*
M.W. McBurney, *Developmental Biology*
M.E. McCully, *Plant Ultrastructure and Development*
John McNeill, *Plant Systematics*
H.G. Merriam, *Woodland Ecosystems*
T.W. Moon, *Comparative Physiology*
Pierre Moreau, *Cell Biology*
C.E. Morris, *Physiology of Excitable Cells*
J.M. Neelin, *Nuclear Proteins and Differentiation*
Constance Nozzolillo, *Plant Physiology, Phytochemistry*
D.D. Peakall, *Wildlife Toxicology*
S.B. Peck, *Arthropod and Beetle Evolution Systematics*
B.J.R. Philogène, *Ecophysiology of Insects*
Jaroslav Picman, *Behavioural Ecology*
S.U. Quadri, *Ichthyology*
Hamish Robertson, *Mammalian Reproductive Physiology*
R.W. Seagull, *Cytology, Ultrastructure*
V.L. Seligy, *Molecular Genetics*
George Setterfield, *Cell Differentiation, Ultrastructure*
John Sinclair, *Biophysics of Cells*
D.A. Smith, *Vertebrate Populations*
K.B. Storey, *Biochemical Adaptations*
Jean Vaillancourt, *Animal Ecology*
P.J. Weatherhead, *Behavioural Ecology*
J.A. Webb, *Plant Metabolism*
Pearl Weinberger, *Environmental Plant Physiology, Ecotoxicology*
Frank Wightman, *Metabolism of Plant Hormones*
D.M. Wood, *Dipteran Taxonomy*
Hiroshi Yamazaki, *Bacterial Metabolism, Biotechnology*

Ottawa-Carleton Graduate Specialization in Neuroscience

The Departments of Biology and Psychology at Carleton University, and the Departments of Anatomy, Physiology, and Psychology at the University of Ottawa provide a graduate specialization in neuroscience at the Ph.D. level (and, under special circumstances, at the M.Sc. or M.A. level). Further details may be obtained from any of the above member departments.

Each campus is well equipped for a wide range of biological research; some major equipment and facilities include transmission and scanning electron microscopes, spectrophotometers, liquid scintillation and other radioactivity counters, high performance liquid and gas chromatographs, amino acid analyzer, preparative and analytical ultracentrifuges, electrophysiology equipment, animal and plant growth facilities, controlled environment cabinets, and on-line computer access. Students also benefit from the resources of nearby government laboratories and libraries (for example, Agriculture Canada, Environment Canada, Health and Welfare Canada, and the National Research Council).

Master of Science

Admission Requirements

An honours B.Sc. or equivalent degree at a standard acceptable to the two universities is required for admission to the M.Sc. program. Applicants with acceptable standing in a non-honours degree may be admitted to a qualifying-year program which will be determined in each case by the admissions committee.

Applicants must demonstrate a fluent knowledge of English (Carleton), or either English or French (Ottawa).

Program Requirements

The M.Sc. degree will be conferred upon a candidate who has fulfilled the following requirements:

- Completion of the advanced courses specified by the admissions committee and the student's advisory committee; these will range from one to three full (two-term) courses, depending on the background and research program of the student. At least one course at the graduate level must be included, and not more than one course at the fourth-year honours level (completed while registered as a graduate student) may form part of the candidate's course requirements. The passing grade for all required courses is 70% or equivalent, and the student is not allowed a supplemental examination. Directed studies or reading courses may not make up more than half of the required number of courses. The admissions committee or the student's advisory committee may also direct the student to take or to audit additional courses. Knowledge of a second language may be specified as a requirement.
- Completion of at least two terms as a full-time student resident at one of the two universities is normally required. Programs for part-time students may be arranged.
- Presentation of one public seminar on the candidate's thesis research.
- Completion of a thesis incorporating the results of original research carried out under the direct supervision of an approved faculty member.
- Successful oral defence of the thesis before an examination board of at least three faculty members, normally drawn from both universities.

Doctor of Philosophy

Admission Requirements

An M.Sc. from a recognized university is usually required for entry to the Ph.D. program; however, an applicant with a first-class B.Sc. and excellent references may be admitted directly to the Ph.D. program. A student already registered for the M.Sc. may be permitted to transfer to the Ph.D. program following a recommendation by the departmental graduate committee and successful completion of the comprehensive examination required of Ph.D. candidates.

All applicants must demonstrate a fluent knowledge of English (Carleton), or either English or French (Ottawa).

Program Requirements

The Ph.D. degree will be conferred upon a candidate who has fulfilled the following requirements:

- Completion of the courses at the graduate level specified by the admissions and advisory committees; these will range from two to four full courses (three to six courses if admitted without an M.Sc.), depending on the background and research program of the student. Only graduate courses may form part of the candidate's course requirements. The passing grade for all required courses is 70%, and the student is not allowed a supplemental examination. Directed studies or reading courses may not make up more than half of the required number of courses. The admissions committee or the student's advisory committee may also direct the student to take or to audit additional courses. Knowledge of a second language may be specified as a requirement.
- Completion of an oral comprehensive examination within approximately 12 months of entry into the program; this examination will cover the candidate's area of research, and general biology. The format of the examination will be established by the departmental graduate committee and approved by the admissions committee. The examination committee will generally be composed of faculty members of both universities.
- Presentation of at least one public seminar on the candidate's thesis research.
- A thesis incorporating the results of original research carried out under the direct supervision of an approved faculty member.
- Completion of at least four terms as a full-time student resident at one of the two universities (or six terms if admitted without an M.Sc.) is normally required. Under exceptional conditions programs may be arranged for part-time students.
- Successful oral defense of the thesis before an examination board of at least five faculty members, with representation from both universities, and including an external examiner from outside the two universities who is an authority on the thesis research area.

Graduate Courses*

- Biology 61.501F1

Topics in Biotechnology

A course concerned with the application of the biological activities of cells, genes, and enzymes (particularly of micro-organisms) to manufacturing, agricultural, and service industries. An emphasis will be placed on genetic and environmental manipulation of microbial metabolism and processes that provide foods, fuels, chemicals, and other useful products.

Prerequisite: A course in cell physiology or biochemistry and permission of the department.

Hiroshi Yamazaki.

- Biology 61.510T2

Advanced Plant Morphogenesis

An advanced course dealing with selected topics in plant morphogenesis.

M.E. McCully.

- Biology 61.517T2

Molecular Genetics

Development and use of genetic methods in the solution of problems in molecular biology, including discussion of innovations and current efforts of *in vivo* and *in vitro* genetic engineering.

Lectures, seminars, laboratory, essays.

Prerequisites: Graduate standing and permission of the department.

V.N. Iyer.

- Biology 61.519T2

Evolutionary Genetics

A lecture/seminar course on the genetic mechanisms and forces responsible for variation and evolutionary change in natural populations. The course will consider both ecological and molecular questions from an evolutionary perspective. Topics will include protein and genome evolution; evolutionary significance of regulatory and structural gene variation; concepts of individual, deme, and

*F,W,S indicates term of offering.
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The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

group selection; relationships of micro-evolution to macro-evolutionary trends; selfish DNA.
Prerequisites: Graduate standing, plus basic courses in genetics and evolution; permission of the department.
(Offered jointly with the Department of Biology, University of Ottawa)
G.R. Carmody and D.A. Hickey.

• Biology 61.525T2
Plant Physiology and Metabolism
An advanced course dealing with selected topics in plant physiology and plant metabolism. This course may be available to final year honours undergraduate students with special permission of the department.
Prerequisites: Graduate standing or permission of the department.
Frank Wightman.

• Biology 61.535T2
Special Studies in Physiology
A course dealing with some of the recent advances in animal physiology.
D.R. Gardner.

• Biology 61.536T2 (BIO 9201)
Photobiology
A course dealing with the interaction between light and living organisms, including an introduction to photochemistry, and a detailed study of photosynthesis, vision, photosensitivity, and photoperiodism.
Prerequisite: An advanced course in animal or plant physiology or biochemistry, or permission of the department.
(Offered jointly with the Department of Biology, University of Ottawa)
John Sinclair, J.T. Arnason, and B.J.R. Philogène.

• Biology 61.547T2
Quantitative Ecology
A lecture and laboratory course on concepts and analysis of the distribution and abundance of plants and animals, and of related environmental phenomena. Two analytical or critical essays on an ecological topic will be required.
Prerequisites: Graduate standing, and courses in elementary ecology and statistics; permission of the department.
C.A. Barlow.

• Biology 61.549T2
Mathematical Modelling for Biologists
This course is designed to develop mathematical tools for the modelling of biological processes. The student is taught the necessary mathematics and Fortran computer language, and guidance is given in the choice and assimilation of a biological process.
L.R. Lefkovitch.

• Biology 61.550T2
Selected Topics
Courses in selected aspects of specialized biological subjects, not covered by other graduate courses; course details will be available at registration.

• Biology 61.551F1
Advanced Topics
Courses in selected aspects of specialized biological subjects, not covered by other graduate courses; course details will be available at registration.

• Biology 61.552W1
Advanced Topics
Courses in selected aspects of specialized biological subjects, not covered by other graduate courses; course details will be available at registration.

• Biology 61.556T2
Advanced Insect/Animal Systematics
Lecture and seminar course concerning methods, rules, and advances in systematics of insects and other animals.
Prerequisite: A 400-level course in identification or classification of insects or other animals.
H.F. Howden.

• Biology 61.565F1, W1, S1
Field Course
Credit for this half-course is based on a total of three weeks of field-course modules, involving one or two weeks of intensive and continuous field work with attendant assignments. For details, see co-ordinator.
Co-ordinator: P.J. Weatherhead.

• Biology 61.570T2
Evolution and Biogeography
Prerequisites: Graduate standing and permission of the department.
H.F. Howden.

• Biology 61.590F1, W1, S1
Directed Special Studies and Research
Not more than one full-course credit for Biology 61.590 is allowed in a graduate program.

• Biology 61.599F, W, S
M.Sc. Thesis

• Biology 61.620T2
Advanced Cell Biology
An advanced lecture and seminar course, dealing with recent developments in cell biology and biochemistry; emphasis on mechanisms of regulation, nuclear organization, chromosome structure, composition and replication, virus organization, ribosomes and protein synthesis, and enzyme regulation. Precludes credit for Biology 61.621 or Biology 61.662.
Prerequisites: An advanced course in cell biology, molecular biology, biochemistry, and/or genetics. (Offered jointly with the Department of Biology, University of Ottawa)
George Setterfield and J.M. Neelin.

• Biology 61.621F1, 61.622W1
Advanced Cell Biology I and II
Course descriptions, prerequisites, and instructors are described under Biology 61.620. Precludes credit for Biology 61.620.

• Biology 61.680T2
Advanced Studies in Animal Behaviour
A seminar and laboratory course dealing with current topics in the study of animal behaviour. Students will be expected to present seminars based on the recent literature, and to conduct a research project on some aspect of animal behaviour.
Prerequisites: Biology 61.581 or equivalent, or permission of the department.
P.J. Weatherhead and M.B. Fenton.

• Biology 61.699F, W, S
Ph.D. Thesis

Courses Not Offered in 1983-84

61.503 Biochemical Adaptations of Organisms to the Environment
61.524 Developmental Cell Biology
61.541 Mammalian Reproductive Biology
61.542 Developmental Endocrinology
61.548 Population Biology of Species and Communities
61.557 Arachnology
61.575 Mammalogy
61.581 Animal Behaviour
61.600 Current Developments in Molecular Genetics
61.625 Advanced Plant Physiology
61.630 Advanced Plant Biochemistry

The Ottawa-Carleton Institute for Graduate Studies and Research in Chemistry

The Institute

Director of the Institute: D.C. Wigfield

The institute, established in 1981, represents the combined research strengths of Carleton University and the University of Ottawa. Research facilities are available on both campuses, and graduate students will conduct their research on the campus where the faculty members under whose supervision they have chosen to work maintain a laboratory. Programs leading to the degrees of M.Sc. and Ph.D. in most areas of chemistry are available.

Members of the Institute

Howard Alper, *Organometallic Chemistry*
J.W. ApSimon, *Natural Products Chemistry*
M.H. Back, *Chemical Kinetics and Photochemistry*
H.H. Baer, *Carbohydrate Chemistry*
R.G. Barradas, *Electrochemistry*
D.M. Bishop, *Theoretical Chemistry*
G.W. Buchanan, *Use of NMR Spectroscopy in Organic Problems*
P.H. Buist, *Bio-organic Chemistry*
C.L. Chakrabarti, *Analytical Chemistry*
B.E. Conway, *Electrochemistry*
Christian Detellier, *Bio-inorganic Chemistry*
Tony Durst, *Synthetic Medicinal Organic Chemistry*
R.R. Fraser, *Physical Organic Chemistry*
J.M.J. Frechet, *Organic Polymer Chemistry*
B.R. Hollebone, *Chemical Spectroscopy and Chemical Toxicology*
J.L. Holmes, *Mass Spectroscopy*
J.A. Koningstein, *Chemical Physics*
Peeter Kruus, *Structure and Dynamics in Liquids and Solutions*
K.J. Laidler, *Reaction Kinetics*
J.B. Milne, *Inorganic Chemistry*
Peter Morand, *Organic Chemistry*
B.A. Morrow, *Surface Chemistry and Catalysis*
J.-L.A. Roustan, *Bio-inorganic Chemistry*
J.J. Sloan, *Infrared Chemiluminescence*
I.C.P. Smith, *NMR Studies of Biologically Important Molecules*
Heshel Teitelbaum, *Gas Phase Reactions*
C.S. Tsai, *Enzyme Chemistry*
A.D. Westland, *Physical Inorganic Chemistry*
D.C. Wigfield, *Chemical Toxicology*
R.H. Wightman, *Synthetic Organic Chemistry*
D.R. Wiles, *Radio-analytical Chemistry*
J.S. Wright, *Molecular Reaction Dynamics*

Master of Science

Admission Requirements

The normal requirement for admission to the program is an Honours B.Sc. degree in Chemistry, with at least high second-class standing. Applicants who do not meet this requirement, or whose undergraduate degree is in another, closely related field, may be accepted into the program, but may be assigned extra courses.

Program Requirements

- A research thesis, which will be defended at an oral examination
- Two graduate courses (one semester each)
- One seminar course (two semesters)

Doctor of Philosophy

Admission Requirements

The normal requirement for admission to the Ph.D. program is a B.Sc. or an M.Sc. degree in Chemistry.

Program Requirements (from B.Sc.)

- A research thesis, to be defended before an examination board which will include an external examiner
- A comprehensive examination in chemistry; the format of this examination depends upon the field of chemistry in which the student is conducting his/her research
- Seven graduate courses (one semester each)
- Two seminar courses (two semesters each)

Program Requirements (from M.Sc.)

- As above, except that credit for up to two graduate courses may be given to reduce the requirement for graduate courses from seven to five.

Residence Requirements

For the M.Sc. degree
- at least one year of full-time study

For the Ph.D. degree (from B.Sc.)
- at least three years of full-time study

For the Ph.D. degree (from M.Sc.)
- at least two years of full-time study

Graduate Courses*

- Chemistry 65.509 (CHM8150)
Special Topics in Molecular Spectroscopy
- Chemistry 65.515 (CHM8110)
Algebraic Quantum Mechanics of Molecular Structure
- Chemistry 65.517 (CHM8161)
Physical Chemistry of Solutions
- Chemistry 65.519 (CHM8149)
Molecular Reaction Dynamics
- Chemistry 65.520 (CHM8152)
Surface Chemistry and Catalysis
- Chemistry 65.522 (CHM8131)
Electrochemistry I
- Chemistry 65.523 (CHM8129)
Electrochemistry II
- Chemistry 65.525 (CHM8141)
Chemistry of Natural Products
- Chemistry 65.526 (CHM8155)
Nucleic Acid Chemistry
- Chemistry 65.527 (CHM8121)
Organic Reaction Mechanisms
- Chemistry 65.528 (CHM8133)
Multinuclear Magnetic Resonance Spectroscopy
- Chemistry 65.532 (CHM8153)
Chemical Mechanisms of Biochemical Reactions
- Chemistry 65.540 (CHM8114)
Special Topics in Non-Metal Chemistry
- Chemistry 65.541 (CHM8117)
Organometallic Chemistry
- Chemistry 65.542 (CHM8115)
Special Topics in Inorganic Chemistry
- Chemistry 65.543 (CHM8112)
Methods in Analytical Chemistry
- Chemistry 65.544 (CHM 8125)
Organic Synthesis
- Chemistry 65.545 (CHM8127)
Chemistry of Carbohydrates
- Chemistry 65.546 (CHM8128)
Specialty Polymers: An Organic Approach
- Chemistry 65.547 (CHM8134)
Spectroscopy for Organic Chemists
- Chemistry 65.548 (CHM8122)
Special Topics in Organic Chemistry
- Chemistry 65.549 (CHM8123)
Recent Advances in Organic Chemistry
- Chemistry 65.550 (CHM8116)
Analytical Instrumentation
- Chemistry 65.551T (CHM8220S)
Problems in Organic Chemistry
- Chemistry 65.555 (CHM8119)
Analytical Atomic Spectroscopy: Absorption
- Chemistry 65.556 (CHM8120)
Analytical Atomic Spectroscopy: Emission and Fluorescence
- Chemistry 65.561 (CHM8118)
Advanced Physical Inorganic Chemistry
- Chemistry 65.570 (CHM8151)
Electrochemistry III
- Chemistry 65.571 (CHM8145)
Photochemistry
- Chemistry 65.572 (CHM8135)
Theories of Reaction Rates
- Chemistry 65.573 (CHM8137)
Advanced Chemical Kinetics
- Chemistry 65.574 (CHM8142)
Symmetry in Chemistry

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

- Chemistry 65.575 (CHM8140)
Chemical Spectroscopy
- Chemistry 65.576 (CHM8148)
Gas Phase Ion Chemistry
- Chemistry 65.577 (CHM8138)
Enzyme Kinetics and Mechanisms
- Chemistry 65.578 (CHM8156)
Chemical Toxicology I
- Chemistry 65.579 (CHM8157)
Chemical Toxicology II
- Chemistry 65.581T (CHM8256S)
Seminar I†
- Chemistry 65.582T (CHM8257S)
Seminar II†
- Chemistry 65.583T (CHM8258S)
Seminar III†
- Chemistry 65.584 (CHM8143)
Selected Topics in Physical Chemistry
- Chemistry 65.590 (CHM8158)
Directed Special Studies
- Chemistry 65.599 (CHM7999)
M.Sc. Thesis
- Chemistry 65.699 (CHM9999)
Ph.D. Thesis

†Full-course credit; graded satisfactory/unsatisfactory.

The Ottawa-Carleton Centre for Geoscience Studies

The Centre

The centre, established in 1982, represents the combined research strengths of Carleton University and the University of Ottawa. Research facilities are available on both campuses, and graduate students will conduct their research on the campus where the faculty members under whose supervision they have chosen to work maintain a laboratory. Programs are available leading to the degrees of M.Sc. and Ph.D. in most areas of geology. Four areas of geological research are emphasized, each involving a major component of field work: Precambrian geology, structural geology and geodynamics, Arctic studies, and resource geology.

Members of the Centre

F.P. Agterberg, *Geomathematics*
A.J. Baer, *Proterozoic Orogenies; Grenville Province*
Keith Bell, *Isotope Studies; Petrology; Geochronology*
John Blenkinsop, *Mass Spectrometry; Geochronology*
R.L. Brown, *Structural Geology*
G.Y. Chao, *Mineralogy; Crystallography*
J.A. Donaldson, *Precambrian Stratigraphy and Sedimentology*
O.A. Dixon, *Invertebrate Paleontology, Stratigraphy; Canadian Arctic*
H.M. French, *Permafrost and Periglacial Phenomena*
Edgar Froese, *Metamorphic Petrology; Thermodynamics*
W.K. Fyson, *Structural Analyses in Metamorphic Terranes*
D.D. Hogarth, *Mineralogy; Igneous and Metamorphic Petrology; Alkalic Rocks*
Kenneth Hooper, *Paleontology, Microplankton and Paleo-oceanography*
I.R. Jonasson, *Geochemistry; Ore Deposits*
Ralph Kretz, *Petrology and Geochemistry of Metamorphic Rocks*
Jarmila Kukalova-Peck, *Paleontology; Fossil Insects*
F.A. Michel, *Isotope Geochemistry; Groundwater in Permafrost and Geothermal Regions*
J.M. Moore, *Metamorphic Petrology, Volcanology, Precambrian Geology*
C.R. Pride, *Geochemistry of Granites, Migmatites; Basalt Alteration*
Giorgio Ranalli, *Rheology of the Earth; Geodynamics; Plate Tectonics*
Brian Rust, *Clastic Sedimentology (Recent and Ancient); Coal Basins*
D.F. Sangster, *Metallic Mineral Deposits; Geochemistry*
G.B. Skippen, *Metamorphic Petrology; Experimental Petrology; Aqueous Geochemistry*
Ján Veizer, *Sedimentary Geochemistry; Carbonates; Diagenesis; Ores; Precambrian Sedimentology*
D.H. Watkinson, *Metallic Mineral Deposits*
R.W. Yole, *Stratigraphy and Sedimentology; Petroleum Geology*

Master of Science

Admission Requirements

The normal requirement for admission to the program is an honours B.Sc. degree, with at least high second-class standing, in Geology or a related discipline.

Program Requirements

- A research thesis, which will be defended at an oral examination
- Two graduate full courses
- Participation in the geoscience seminar series.

Doctor of Philosophy

Admission Requirements

The normal requirement for admission to the Ph.D. program is an M.Sc. degree in Geology or a related discipline. Students with outstanding academic performance and research promise may be permitted to transfer to the Ph.D. program without completing the M.Sc.

Program Requirements

- A research thesis, to be defended orally before an examination board which will include an external examiner

- A comprehensive examination, with emphasis on areas chosen by the student's advisory committee
- Two graduate full courses
- Participation in the geoscience seminar series.

All thesis, seminar, and examination requirements may be met either in French or English. Courses will be offered in French wherever appropriate.

Residence Requirement

The normal residence requirement for the Ph.D. degree is at least four terms of full-time study.

Graduate Courses*

- Geology 67.504 (GEO5381)
Field Studies
- Geology 67.505
Mineral Economics
- Geology 67.514 (GEO 5332)
Tectonophysics
- Geology 67.515 (GEO 5333)
Petrofabrics
- Geology 67.521, 67.522 (GEO5370; 5371)
Mineral Deposits
- Geology 67.523 (GEO 5372)
The Fossil Fuels
- Geology 67.525
Advanced Crystallography
- Geology 67.526 (GEO5323)
Radioactive Minerals and Occurrences
- Geology 67.531, 67.532 (GEO5310; 5311)
Advanced Paleontology
- Geology 67.534 (GEO5312)
Palynology and Microplankton
- Geology 67.540 (GEO5331)
Tectonics
- Geology 67.542 (GEO5330)
Advanced Structural Geology
- Geology 67.551 (GEO5345)
Advanced Metamorphic Petrology
- Geology 67.552 (GEO5344)
Advanced Igneous Petrology
- Geology 67.553 (GEO5346)
Physical Volcanology
- Geology 67.554 (GEO5744)
Pétrogenèse ignée (avancée)
- Geology 67.561, 67.562 (GEO5360; 5361)
Stratigraphy and Sedimentology
- Geology 67.562, 67.563 (GEO5390)
Precambrian Geology
- Geology 67.564 (GEO5790)
Géologie du Précambrien
- Geology 67.565 (GEO5380)
Geology of Arctic Canada
- Geology 67.581 (GEO5352)
Advanced Inorganic Geochemistry
- Geology 67.582
Isotope Geology
- Geology 67.583 (GEO5354)
Physics of the Earth
- Geology 67.584 (GEO5351)
Sedimentary Geochemistry
- Geology 67.585 (GEO5353)
Physical Geochemistry
- Geology 67.589 (GEO 5350)
Historical Geochemistry
- Geology 67.590, 67.591 (GEO5392; 5393)
Directed Studies
- Geology 67.592 (GEO 5391)
Current Problems in Geology
- Geology 67.599 (GEO7999)
M.Sc. Thesis
- Geology 67.699 (GEO9999)
Ph.D. Thesis

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

*Half-courses. Not all courses are offered in any one calendar year; equal numbers of courses are offered annually at both campuses.

The Committee

Chairman of the Committee: Frantisek Fiala

With the co-operation of the Department of Mathematics and Statistics and the Department of Systems and Computer Engineering, the committee offers programs of graduate study and research leading to the degree of Master of Science.

Within the program, four areas of specialization exist:

- Information Systems Engineering
- Numerical and Non-Numerical Applications of Computers
- Computer Science
- Mathematical Systems Theory and Applications

Combining elements from the disciplines of mathematics, statistics, systems engineering, computer science, and electrical engineering, the program is oriented towards the high-level theorist/practitioner who is called upon to examine systems-related problems, frequently of an interdisciplinary nature. Topics spanned by the four areas above include computer network design, mini/microcomputer systems, database systems, software development, theory of algorithms, dynamical systems, statistics, and operations research. Close links are maintained with the scientific, industrial, and technological communities, and an effort is made to direct students to project work of current practical significance.

Qualifying-Year Program

Applicants who have a general (pass) bachelor's degree, or who otherwise lack the required undergraduate preparation, may be admitted to a qualifying-year program. Refer to the general section of this calendar for regulations governing the qualifying year.

Master of Science

Admission Requirements

Applicants should have an honours bachelor's degree, or equivalent, with at least high second-class standing, in mathematics, engineering, physics, chemistry, computer science, operations research, experimental psychology, econometrics, management science, or a related discipline. Undergraduate preparation should include at least two full courses in computing and a minimum of three full courses in mathematics, at least one of which is at the third-year level or higher. In addition, the student is required to have some knowledge of quantitative applications, such as numerical analysis, simulation, operations research, etc.

Admissions to the program will be made through one of the two participating departments. Since space and laboratory facilities will be provided by one of the departments, students should apply through the department with which they wish to be most closely associated.

Program Requirements

The normal program comprises eight half-courses and a thesis having a weight of 1½ full courses; additional requirements may also be stipulated, depending upon the individual student's background. With the approval of the committee, students who have substantial work experience may be permitted to substitute three additional half-courses in place of the thesis, one of which must be a graduate project course.

Students must take at least one full course from each of the two participating departments as well as the joint course 70/94.582: Topics in Information Science. Each student should consult with his faculty adviser in the selection of a course pattern related to his principal area of interest.

Each candidate submitting a thesis will be required to undertake an oral examination on the subject of his thesis.

Course work may be completed on either a full-time or part-time basis. Thesis research normally requires full-time residence at the University; however, a candidate may be permitted to carry out thesis work off campus provided that suitable arrangements are made for supervision and experi-

mental work, and prior approval is given by the committee.

Graduate Courses*

- Information and Systems Science 70/94.582WI
Topics in Information and Systems Science
The purpose of this course is to bring together fundamental results in the new and active area of design and analysis of efficient computer algorithms for large, complex problems. Areas of application include data manipulation, computer networks, queueing systems, and optimization.

- Information and Systems Science 70/94.598F3, W3, S3
M.Sc. Thesis in Information and Systems Science

Mathematics and Statistics
Undergraduate Courses:
70.301 Real Analysis I
70.302 Real Analysis II
70.310 Modern Algebra
70.350 Mathematical Statistics
70.403 Functional Analysis
70.451 Probability Theory
70.452 Sampling Theory and Methods I
70.453 Applied Multivariate Analysis
70.456 Non-Parametric Methods I
70.457 Statistical Inference
70.458 Stochastic Models
70.459 Stochastic Optimization
70.470 Partial Differential Equations I
70.471 Partial Differential Equations II
70.473 Qualitative Theory of Ordinary Differential Equations
70.482 Introduction to Mathematical Logic
70.483 Topics in Applied Logic
70.484 Design and Analysis of Algorithms
70.485 Theory of Automata
70.486 Numerical Analysis
70.487 Game Theory
70.496 Directed Studies

Graduate Courses:
70.500 Analysis
70.510 General Algebra
70.552 Sampling Theory and Methods II
70.553 Analysis of Variance I
70.554 Stochastic Processes and Time Series Analysis
70.555 Design of Experiments
70.556 Robust Statistical Inference
70.557 Statistical Inference
70.558 Topics in Stochastic Processes
70.559 Multivariate Analysis
70.561 Stochastic Optimization
70.565 Theory of Automata
70.567 Game Theory
70.569 Topics in Combinatorial Mathematics
70.570 Probability Theory
70.571 Stochastic Models
70.581 Linear Optimization
70.583 Nonlinear Optimization
70.584 Topics in Operations Research
70.585 Topics in Algorithm Design
70.586 Numerical Analysis
70.587 Formal Languages and Syntax Analysis
70.588 Combinatorial Optimization
70.589 Combinatorial Optimization
70.590 Seminar in Mathematics
70.591 Directed Studies
70.593 Project
70.652 Advanced Design of Surveys

Systems and Computer Engineering
Undergraduate courses:
94.303 Real-Time Computing Systems
94.367 Switching Circuits
94.401 Operating Systems
94.405 Discrete Simulation and its Applications
94.433 Advanced Real-Time Programming
94.445 Discrete Time Systems
94.451 Communication Systems
94.457 Introduction to the Architecture of Computer Systems
94.460 Data Communications
94.461 Microprocessor Systems
94.480 Introduction to Software Engineering
94.481 Software Engineering Project
94.485 Computer Systems Design

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

Graduate Courses:
94.501 Simulation and Modelling
94.504 Computer Methods in Industrial Engineering
94.505 Optimization Theory and Methods
94.507 Expert Systems
94.511 Computer System Design for Performance
94.517 Queueing, Scheduling and Control of Information Systems
94.518 Topics in Information Systems
94.519 Teletraffic Engineering
94.521 Computer Communication
94.527 Distributed Processing Systems
94.531 Topics in Software Engineering
94.532 Systems Engineering Using VLSI Components
94.533 Digital Systems Engineering
94.534 Mini/Micro Applications
94.539 Advanced Topics in Digital Systems Design
94.540 Topics in Office Automation
94.551 Estimation and Detection
94.552 Advanced Linear Systems
94.553 Stochastic Processes
94.554 Principles of Digital Communication
94.557 Fundamentals of Discrete Systems
94.558 Digital Systems Architecture
94.562 Digital Signal Processing
94.565 Advanced Digital Communication
94.566 Multi-Access Communication Systems
94.567 Source Coding and Data Compression
94.568 Mobile Communications Systems
94.571 Mini/Microcomputer Operating System Design
94.573 Integrated Database Systems
94.574 Elements of Computer Systems
94.575 Software Translators and Their Applications
94.576 Analytical Performance Models of Computer Systems
94.577 Teleprocessing Software Design
94.579 Advanced Topics in Software Engineering
94.584 Advanced Topics in Communication Systems
94.589 Advanced Topics in Measurements and Models
94.596 Directed Studies

Because of the interdisciplinary nature of this area, a student will in some cases benefit by taking a third-year course as part of his/her program. In such cases it will be extra to the formal degree requirements, or else arrangements will be made to ensure that the subject matter is enriched through extra reading, etc.

Department of Mathematics and Statistics

The Department

Chairman of the Department: K.S. Williams
Departmental Supervisor of Graduate Studies: C.W.L. Garner

The Department of Mathematics and Statistics offers graduate programs leading to the M.Sc. degree, with specialization in pure mathematics, applied mathematics, probability and statistics, and, in co-operation with the Department of Systems and Computer Engineering, a program leading to the M.Sc. degree in Information and Systems Science; for details regarding this program, see page 125.

The Master of Computer Science (M.C.S.) degree program is offered jointly by the School of Computer Science, the Department of Systems and Computer Engineering, and the Department of Mathematics and Statistics. The program is a joint program with the University of Ottawa and hence students are also able to take courses offered by the Department of Computer Science at the University of Ottawa.

Applicants to the M.C.S. program are required to have an honours degree in computer science (or the equivalent). The program is fully described on page 141 of this calendar.

The Ph.D. degree is offered with specialization in pure mathematics, applied mathematics, and probability and statistics.

The Department of Mathematics and Statistics also offers a co-operative master's program in statistics in collaboration with the federal government, emphasizing practical training through work experience, along with sound training in statistical inference and basic probability theory.

The principal research interests of the faculty include the following fields:

Pure Mathematics
Algebra: group theory; theory of rings and modules; representation theory; universal algebra; ordered structures; homological algebra; categories; commutative algebra

Analysis: inequalities; summability; generalized integral transform; functional analysis; function spaces and algebras; operator theory; measure theory; potential theory

Geometry: non-Euclidean, projective and finite geometries; regular figures

Number theory: asymptotic theory; finite fields; analytic number theory

Topology: structures of continuous functions; categorical topology; fixed point theory: algebraic topology

Applied Mathematics
Applied analysis; combinatorics; numerical analysis; mathematical foundations of computer science and operations research; special functions; asymptotic expansions

Probability and Statistics
Probability theory; stochastic processes; weak and strong laws of invariance principle; goodness of fit; characterizations; multivariate analysis; operations research; distribution theory; analysis of variance; estimation theory; non-parametric methods; experimental design; sampling theory; foundations of statistical inference

Master of Science

Admission Requirements

The minimum requirements for admission to the master's program are outlined in the general section of this calendar. Applicants with a general (pass) bachelor's degree may be admitted to a qualifying-year program.

In addition, applicants may be required to write the Advanced Tests in Mathematics of the Graduate Record Examination.

Program Requirements

The two program options in mathematics are the following:

- Four full courses and a thesis
- Five full courses, without a thesis.

Only *two* of 70.507, 70.518, 70.526, 70.527, 70.528, 70.535, 70.536, 70.546, 70.547, 70.551, 70.565, 70.567, and 70.571 may be offered in fulfilment of the degree requirements. In addition, one course may be selected from those offered at the senior undergraduate (400) level.

At least one of the courses must be taken in a field within mathematics other than the student's major field. Ordinarily, this course should be at the 500 level, but in certain cases this rule may be waived by the chairman of the committee on graduate studies.

If a thesis is written, the candidate will be required to undertake an oral examination on the subject of his thesis.

Students who plan to specialize in probability and statistics are strongly advised that during their master's program they include, where possible, the half-courses 70.450, 70.551 in mathematical statistics; 70.452, 70.555 in applied statistics, and 70.451, 70.571 in probability, together with the equivalent of a further full course in the Department of Mathematics and Statistics. In addition, a graduate course in another field, such as biology, biostatistics, economics, computer science, system analysis, and stochastic modelling, is highly recommended.

Doctor of Philosophy

Admission Requirements

The minimum requirements for admission to the Ph.D. program are outlined in the general section of this calendar.

Program Requirements

The course requirement is a minimum of three graduate courses and a suitable thesis. At least one of the courses must be chosen from those offered outside the candidate's major field.

Language requirements will be determined by the candidate's thesis advisory committee.

A comprehensive examination will be undertaken in the following areas:

- The candidate's general area of specialization at the Ph.D. level
- A basic examination on two topics chosen from algebra, analysis, probability, and topology. (This choice excludes the student's specialty.)

The format of the comprehensive examination will be determined by the candidate's advisory committee, but will consist of four written sections. This examination must be completed successfully within 18 months of admission into the Ph.D. program in the case of a full-time student, and within 36 months of admission in the case of a part-time student.

All Ph.D. candidates are also required to undertake a final oral examination on the subject of their thesis.

Selection of Courses

The following undergraduate courses may, with the approval of the Department of Mathematics and Statistics, be selected by master's candidates in partial fulfilment of their degree requirements:

Mathematics and Statistics

70.401 Vector Calculus
70.403 Functional Analysis
70.407 Measure Theory
70.415 Rings and Modules
70.416 Group Theory
70.417 Commutative Algebra
70.418 Homological Algebra and Category Theory
70.425 Introduction to General Topology
70.426 Introduction to Algebraic Topology
70.427 Foundations of Geometry
70.428 Introduction to Differentiable Manifolds
70.435 Analytic Number Theory
70.436 Algebraic Number Theory
70.445 Analytical Dynamics
70.446 Hydrodynamics and Elasticity
70.447 Tensor Analysis and Relativity Theory
70.450 Parametric Estimation
70.451 Probability Theory
70.452 Sampling: Theory and Methods I
70.453 Applied Multivariate Analysis
70.456 Non-Parametric Methods
70.457 Statistical Inference
70.458 Stochastic Models
70.459 Stochastic Optimization
70.470 Partial Differential Equations I
70.471 Partial Differential Equations II
70.472 Integral Transforms
70.473 Qualitative Theory of Ordinary

Differential Equations
70.482 Introduction to Mathematical Logic
70.483 Topics in Applied Logic
70.484 Design and Analysis of Algorithms
70.485 Theory of Automata
70.486 Numerical Analysis
70.487 Game Theory

Graduate Courses*

• Mathematics 70.500T2
Analysis
Set theory, metric and topological spaces, linear spaces and functional analysis, distributions, operators, introductory spectral theory, measure and integral.
Prerequisites: Mathematics 70.301 and 70.302, familiarity with metric spaces and general mathematical ideas at fourth-year level.
L.D. Nel, W.J. Schneider, and L.E. May.

• Mathematics 70.501W1
Abstract Measure Theory
Abstract measure and integral, L-spaces, complex measures, product measures, differentiation theory, Fourier transforms.
Prerequisite: Mathematics 70.407.
J.N. Pandey and L.D. Nel.

• Mathematics 70.502F1
Distributions and Generalized Functions
Linear topological spaces, countably multinormed spaces, countable union spaces and their duals, testing function spaces, spaces of generalized functions and their structure, Schwartz distributions, calculus of distribution, convolution, analytic representation, and Fourier transform of distributions.
Prerequisite: Mathematics 70.403.
J.N. Pandey.

• Mathematics 70.503F1
Banach Algebras
Commutative Banach algebras; the space of maximal ideals; representation of Banach algebras as function algebras and as operator algebras; the spectrum of an element; special types of Banach algebras: for example, regular algebras, algebras with involution; applications.
L.D. Nel.

• Mathematics 70.504W1
Integral Equations
A survey of the main results in the theory of non-singular linear integral equations; Volterra and Fredholm equations of first and second kind in the L_2 case, with special results for the continuous case; Hermitian kernels; eigen-function expansions; compact operators.
Prerequisites: Mathematics 70.302 and 70.403.
P.R. Beesack.

• Mathematics 70.505F1
Complex Analysis
Complex differentiation and integration, harmonic functions, maximum modulus principle, Runge's theorem, conformal mapping, entire and meromorphic functions, analytic continuation.
Arthur Smith.

• Mathematics 70.507F1
Measure Theory
Measure theory and integration of real-valued functions.
Prerequisite: Mathematics 70.302 or permission of the department.
L.E. May.

• Mathematics 70.509F1
Introduction to Hilbert Space
Geometry of Hilbert Space, spectral theory of linear operators in Hilbert Space.
Prerequisites: Mathematics 70.301, 70.302, and 70.403.
J.N. Pandey.

• Mathematics 70.510T2, S2
General Algebra
Algebraic structures, algebras, lattices, direct decompositions, operator groups and rings, algebraic constructions, ordered groups and rings, normed algebras, topological groups and rings.
Maurice Chacron.

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

• Mathematics 70.511T2
Theory of Groups
Abelian groups, solvable and nilpotent groups, free groups and free products, structure of finite groups, linear groups, simple groups.
J.D. Dixon, Luis Ribes, and J.C. Poland.

• Mathematics 70.512T2
Group Representations and Applications
An introduction to group representations and character theory, with selected applications.
B.M. Puttaswamaiah.

• Mathematics 70.513T2
Rings and Modules
Generalizations of the Wedderburn-Artin theorem and applications, homological algebra.
Maurice Chacron, Vlastimil Dlab, and B.M. Puttaswamaiah.

• Mathematics 70.515T2
Topological Groups
General topological groups, subgroups and factor groups, local properties. Haar integral, Lie groups.
M.J. Moore and Luis Ribes.

• Mathematics 70.516W1
Group Theory
Fundamental principles as applied to abelian, nilpotent, solvable, free, and finite groups; representations.
Prerequisite: Mathematics 70.310 or permission of the department.
Luis Ribes, B.M. Puttaswamaiah, J.D. Dixon, and J.C. Poland.

• Mathematics 70.518W1
Homological Algebra and Category Theory
Axioms of set theory, categories, functors, natural transformations; free, projective, injective and flat modules; tensor products and homology functors, derived functors; dimension theory.
Prerequisite: Mathematics 70.310 or permission of the department.
I.S. Pressman and Luis Ribes.

• Mathematics 70.520T2
Topology
General topology, homotopy theory, the fundamental group, complexes, differentiable manifolds, homology theory.
Prerequisites: Mathematics 70.301, 70.302, 70.310.
M.J. Moore, L.D. Nel, and I.S. Pressman.

• Mathematics 70.521T2
Topics in Foundations of Geometry
Various axiom systems of geometry. Detailed examinations of at least one modern approach to foundations, with emphasis upon the connections with group theory.
Prerequisite: Permission of the department.
C.W.L. Garner.

• Mathematics 70.522F1
Homology Theory
The Eilenberg-Steenrod axioms and their consequences, singular homology theory, applications to topology and algebra.
Prerequisite: Mathematics 70.425.
H.H. Schirmer and I.S. Pressman.

• Mathematics 70.526W1
Introduction to Algebraic Topology
Two-dimensional manifolds, homotopy, the fundamental group, covering spaces, CW-complexes.
Prerequisite: Mathematics 70.310 and 70.425, or permission of the department.
Kenneth Hardy, H.H. Schirmer, and I.S. Pressman.

• Mathematics 70.527F1
Foundations of Geometry
A study of at least one modern axiom system of Euclidean and non-Euclidean geometry, embedding of hyperbolic and Euclidean geometries in the projective plane, groups of motions, models of non-Euclidean geometry.
Prerequisite: Mathematics 70.310 (may be taken concurrently) or permission of the department.
C.W.L. Garner and B.C. Mortimer.

• Mathematics 70.528F1
Introduction to Differentiable Manifolds
A study of differentiable manifolds from the point of view of either differential topology or differential geometry. Topics such as smooth mappings, transversality, intersection theory, vector fields on manifolds, Gaussian curvature, Riemannian manifolds, differential forms, tensors, and connections are included.
Prerequisite: Mathematics 70.301 or permission of the department.
H.H. Schirmer.

• Mathematics 70.530T2
Methods of Number Theory
Introduction to the Hardy-Littlewood method, sieve methods of Brun and Selberg, character sums.
Prerequisite: Mathematics 70.435.
K.S. Williams.

• Mathematics 70.532T2
Algebraic Number Theory
Valuations, local fields, algebraic number fields, class number, unit theorem, extension of number fields, ramification theory, quadratic and cyclotomic fields.
Prerequisite: Mathematics 70.436.
K.S. Williams.

• Mathematics 70.535F1
Analytic Number Theory
Dirichlet series, characters, Zeta-functions, prime number theorem, Dirichlet's theorem on primes in arithmetic progressions, binary quadratic forms.
Prerequisite: Mathematics 70.307 or permission of the department.
K.S. Williams.

• Mathematics 70.536W1
Algebraic Number Theory
Algebraic number fields, bases, algebraic integers, integral bases, arithmetic in algebraic number fields, ideal theory, class number.
Prerequisite: Mathematics 70.310 or permission of the department.
K.S. Williams.

• Mathematics 70.540T2
Advanced Classical Mechanics
Hamiltonian dynamics; integral invariants; non-holonomic systems; rigid body motions.
Prerequisite: Mathematics 70.345 or permission of the department.
Mizanur Rahman.

• Mathematics 70.541F1
Advanced Methods of Applied Mathematics I: Calculus of Variations
Extreme values of functionals; necessary conditions for an extremum. Sufficient conditions for an extremum. Hamilton-Jacobi Theory and the Maximum Principle of Pontryagin. The problem of Lagrange: the Isoperimetric problem.
Prerequisite: Mathematics 70.345 or permission of the department.
D.W. Sida.

• Mathematics 70.542W1
Advanced Methods of Applied Mathematics II: Special Functions and Asymptotic Methods
Hypergeometric and Generalized Hypergeometric functions; classical orthogonal polynomials in discrete and continuous variables. Confluent, Hypergeometric and Bessel functions. Asymptotic expansions; steepest descent, WKBJ approximation and other asymptotic methods.
Prerequisite: Mathematics 70.307 and 70.308, or permission of the department.
Mizanur Rahman.

• Mathematics 70.543F1
Theory of Subsonic Flows
Integral formulation of the basic equations of gas dynamics. Boundary conditions for moving surfaces, including surfaces of discontinuity. Regular and singular perturbation problems, with applications to airfoil theory and viscous flow theory. Linearized subsonic theory, with applications to flows about wings and slender bodies. Hodograph methods and higher order theories of compressible subsonic flow.
Prerequisite: Mathematics 70.446 or permission of the department.
(Also offered as Engineering 88.506)
E.J. Norminton.

• Mathematics 70.544W1
Theory of Supersonic Flows
The theory of characteristics derived by matrix methods. Applications to one-dimensional unsteady and two-dimensional steady supersonic flows. Wave propagation in shock tubes. Rarefaction and compression waves. Riemann invariants and wave interaction problems. Structure of a shock front. Supersonic sources with applications to wings and bodies. Supersonic flow about oscillating airfoils.
Prerequisite: Mathematics 70.446 or permission of the department.
(Also offered as Engineering 88.507)
Paul Mandl.

• Mathematics 70.546F1
Introduction to Partial Differential Equations
First order linear, quasi-linear, and nonlinear equations; second order equations in two or more variables; systems of equations; the wave equation; Laplace and Poisson equations; Dirichlet and Neumann problems; Green's functions.
Prerequisite: Mathematics 70.302, or 70.307 and 70.308, or permission of the department.
J.N. Pandey.

• Mathematics 70.547W1
Topics in Partial Differential Equations
Theory of distributions, initial-value problems based on two-dimensional wave equations, Laplace transform, Fourier integral transform, diffusion problems, Helmholtz equation with application to boundary and initial-value problems in cylindrical and spherical co-ordinates.
Prerequisite: Mathematics 70.546 or permission of the department.
J.N. Pandey.

• Mathematics 70.550F1
Multivariate Normal Theory
Multivariate normal distribution properties, characterization, estimation of means, and covariance matrix. Regression approach to distribution theory of statistics; multivariate tests; correlations; classification of observations; Wilks' criteria.
Prerequisite: Mathematics 70.350.
D.K. Dale and Ehsanes Saleh.

• Mathematics 70.551W1
Statistical Inference
Sufficient statistics, simple and composite hypotheses, most powerful and similar region tests, distribution-free tests, confidence intervals, goodness-of-fit and likelihood ratio tests, large sample theory, Bayesian and likelihood methods, sequential tests.
Prerequisite: Mathematics 70.450 or permission of the department.
J.N.K. Rao and A.B.M.L. Kabir.

• Mathematics 70.552W1
Sampling Theory and Methods II
Ratio and regression estimation theory; unequal probability sampling; multi-stage sample designs; two-phase sampling; interpenetrating samples; domains of study; nonsampling errors; related topics.
Prerequisite: Mathematics 70.452 or permission of the department.
J.N.K. Rao.

• Mathematics 70.553F1
Analysis of Variance I
The basic mathematical theory of the analysis of variance; mathematical models; estimable functions; Gauss-Markov theorems; confidence ellipsoids; tests of hypotheses; the one-way and some higher-way layouts; analysis of covariance.
Prerequisite: Mathematics 70.450 or permission of the department.
A.B.M.L. Kabir.

• Mathematics 70.554F1
Stochastic Processes and Time Series Analysis
Stationary stochastic processes, inference for stochastic processes, applications to time series and spatial series analysis.
Prerequisites: Mathematics 70.451 or permission of the department.
D.A. Dawson.

• Mathematics 70.555W1
Design of Experiments
Interpretation of factorial experiment; confounding; fractional replication; split plot, split block, Latin square, Graeco-Latin square, lattice and incomplete block designs; response surface techniques.
Prerequisite: Mathematics 70.453 or permission of the department.
J.N.K. Rao.

• Mathematics 70.556W1
Robust Statistical Inference
Nonparametric tests for location, scale, and regression parameters; derivation of rank tests; distribution theory of linear rank statistics and their efficiency. Robust estimation of location, scale and regression parameters; Huber's M-estimators, Rank-method, L-estimators. Influence function. Adaptive procedures.
Prerequisite: Mathematics 70.456 or permission of the department.
Miklos Csörgö and Ehsanes Saleh.

• Mathematics 70.557W1
Statistical Inference
Pure significance tests; uniformly (or locally) most powerful tests; likelihood ratio tests; tests of fit; asymptotic comparisons of tests; likelihood, Bayesian and empirical Bayesian methods; fiducial and structural arguments.
Prerequisite: Mathematics 70.450 or permission of the department.
J.N.K. Rao and Peter Tan.

• Mathematics 70.558F1
Topics in Stochastic Processes
Course contents will vary, but will include topics drawn from Markov processes. Brownian motion, stochastic differential equations, martingales, Markov random fields, random measures and infinite particle systems, advanced topics in modelling; population models, etc.
Prerequisite: Mathematics 70.356 and 70.451, or permission of the department.
Miklos Csörgö.

• Mathematics 70.559F1
Multivariate Analysis
Multivariate methods of data analysis, including principal components, cluster analysis, factor analysis, canonical correlation, MANOVA, profile analysis, discriminant analysis, path analysis.
Prerequisite: Mathematics 70.450 or permission of the department.
J.E. Graham.

• Mathematics 70.561F1
Stochastic Optimization
Decision making under uncertainty: stochastic dynamic programming, Markov decision processes, search theory, sequential inference problems, optimal stopping. Applications in various fields. Students will present a paper on applications of particular interest to them.
Prerequisites: Mathematics 70.356 or a course in stochastics, or permission of the department.
R.M. Fischler.

• Mathematics 70.565F1
Theory of Automata
Algebraic structure of sequential machines, decomposition of machines; finite automata, formal languages; complexity.
Prerequisite: Mathematics 70.210 or permission of the department.
Vlastimil Dlab and J.C. Poland.

• Mathematics 70.567F1
Game Theory
Two-person zero-sum games; infinite games; multi-stage games; differential games; utility theory; two-person general-sum games; bargaining problem; n-person games; games with a continuum of players.
Prerequisite: Mathematics 70.301 or permission of the department.
Peter Tan.

• Mathematics 70.569F1
Topics in Combinatorial Mathematics
Prerequisite: Permission of the department.

• Mathematics 70.570T2
Probability Theory
Axioms, expectation and integration; zero-one law; Borel-Cantelli lemma; Kolmogorov's extension theorem; convergence concepts, laws of large numbers, characteristic functions; weak convergence; invariance principle, Brownian motion; Markov chains, conditional expectation, martingales.
Prerequisites: Mathematics 70.301, 70.302, 70.407.
Miklos Csörgö and D.A. Dawson.

• Mathematics 70.571W1
Stochastic Models
Markov systems, stochastic networks, queuing networks, spatial processes, approximation methods in stochastic processes and queueing theory. Applications to the modelling and analysis of computer-communications systems and other distributed networks.
Prerequisites: Mathematics 70.356 or permission of the department.
D.A. Dawson.

• Mathematics 70.581F1
Linear Optimization
Linear programming problems; simplex method, upper bounded variables, free variables; duality; post-optimality analysis; linear programs having special structures; integer programming problems; unimodularity; knapsack problem.
Prerequisite: A course in linear algebra and permission of the department.
Frantisek Fiala.

• Mathematics 70.582W1
Topics in Information and Systems Science
The purpose of this course is to bring together fundamental results in the new and active area of design and analysis of efficient computer algorithms for large, complex problems. Areas of application include data manipulation, computer networks, analysis, queueing systems, optimization, etc.
(Also offered as Engineering 94.582)
R.J.A. Buhr, Frantisek Fiala, and B.C. Mortimer.

• Mathematics 70.583W1
Nonlinear Optimization
Methods for unconstrained and constrained optimization problems; Kuhn-Tucker conditions; penalty functions, duality; quadratic programming; geometric programming; separable programming; integer nonlinear programming; pseudo-Boolean programming; dynamic programming.
Prerequisite: Permission of the department.
W.H. Cunningham.

• Mathematics 70.584F1, W1, S1
Topics in Operations Research

• Mathematics 70.585F1, W1, S1
Topics in Algorithm Design

• Mathematics 70.586F1
Numerical Analysis
Error analysis for fixed and floating point arithmetic; systems of linear equations; eigen-value problems; sparse matrices; interpolation and approximation, including Fourier approximation; numerical solution of ordinary and partial differential equations.
Prerequisite: Permission of the department.
L.E. May.

• Mathematics 70.587F1
Formal Language and Syntax Analysis
Context-free languages; ambiguity; the parsing problem; parallel top-down and bottom-up methods; backtrack and n-backtrack methods and suitable languages; LR (k), bounded-context and precedence grammars, relation to automata.
Prerequisite: Mathematics 70.485 desirable; permission of the department.
Frantisek Fiala and Michael Atkinson.

• Mathematics 70.588W1
Combinatorial Optimization
Network flow theory and related material. Topics will include shortest paths, minimum spanning trees, maximum flows, minimum cost flows. Optimal matching in bipartite graphs.
Prerequisite: Permission of the department.
W.H. Cunningham and B.C. Mortimer.

• Mathematics 70.589W1
Combinatorial Optimization
Topics include optimal matching in non-bipartite graphs, Euler tours and the Chinese Postman problem. Other extensions of network flows: dynamic flows, multicommodity flows, and flows with gains. Bottleneck problems. Matroid optimization. Enumerative and heuristic algorithms for the Travelling Salesman and other "hard" problems.
Prerequisite: Mathematics 70.588.
W.H. Cunningham.

• Mathematics 70.590T2
Seminars in Mathematics

• Mathematics 70.591F1, W1, S1
Directed Studies

• Mathematics 70.593F1, W1, S1
Project
This course is intended for students registered in the M.Sc. degree program in Information and Systems Science and the M.C.S. program. Students pursuing the non-thesis option will conduct a study, analysis, and/or design project under the supervision of a faculty member. Results will be given in the form of a typewritten report and presented at a departmental seminar.

• Mathematics 70.594F1, W1, S1
Co-operative Project
This course is intended for students registered in the co-operative master's program in statistics. Students will register in this course during their work term; a grade will be assigned on the basis of a report submitted at the end of the work term.

• Mathematics 70/94/95.595F4,W4,S4
M.C.S. Thesis

• Mathematics 70/94.598F3,W3,S3
M.Sc. Thesis in Information and Systems Science

• Mathematics 70.599F2, W2, S2
M.Sc. Thesis

• Mathematics 70.601W1
Topological Vector Spaces
Construction of new topological vector spaces out of given ones; local convexity and the Hahn-Banach theorem; compactness and the Krein-Milman theorem; conjugate spaces, polar sets.
Prerequisite: Mathematics 70.403.
L.D. Nel.

• Mathematics 70.602W1
Harmonic Analysis on Groups
Transformation groups; Haar measure; unitary representations of locally compact groups; completeness and compact groups; character theory; decomposition.
B.M. Puttaswamaiah.

• Mathematics 70.603W1
Applications of Generalized Functions
Generalized integral transforms; Laplace, Mellin, Hankel, Weierstrass, K- and Convolution transforms; generalized solutions of partial differential equations; further applications.
Prerequisite: Mathematics 70.502.
J.N. Pandey.

• Mathematics 70.608F1
Topics in Analysis

• Mathematics 70.609W1
Topics in Analysis

• Mathematics 70.610T2
Universal Algebra
Concept of a universal algebra; homomorphisms, kernels of homomorphisms, decomposition of homomorphisms; free word algebras and some of their properties; free algebras within classes of algebras; constructions of free members; equationally definable classes; polarity.
Vlastimil Dlab.

• Mathematics 70.611T2
Topics in Group Theory

• Mathematics 70.612T2
Category Theory
Categories and functors; limits; adjoint functors; triples and algebras; abelian categories; homological algebra.
Vlastimil Dlab.

• Mathematics 70.613T2
Topics in Ring Theory

• Mathematics 70.621F1
Topics in Topology

• Mathematics 70.622W1
Topics in Topology

• Mathematics 70.643T2
Mathematical Theory of Hypersonic Flow
Basic equations of inviscid, unsteady hypersonic flow; small disturbance theory, Newtonian theory; optimum body shapes; bluntbody theory; hypersonic flow past oscillating wedges and cones; hypersonic boundary layers.
Prerequisite: Mathematics 70.543 or permission of the department.
Paul Mandl.

• Mathematics 70.652W1
Advanced Design of Surveys
Foundations of survey sampling; maximum likelihood and Bayesian estimation; super population and random permutation models; multiple frame theory; analytical surveys; related topics.
Prerequisite: Mathematics 70.552 or permission of the department.
J.N.K. Rao.

• Mathematics 70.657F1
Topics in Probability and Statistics

• Mathematics 70.658F1
Topics in Probability and Statistics

• Mathematics 70.690T2
Seminars in Mathematics

• Mathematics 70.691F1, W1, S1
Directed Studies

• Mathematics 70.699F, W, S
Ph.D. Thesis

The Department

Chairman of the Department: M.K. Sundaresan
Departmental Supervisor of Graduate Studies: Lazer Resnick

The Department of Physics offers programs of study and research leading to the M.Sc. and Ph.D. degrees.

At the M.Sc. level, the department offers programs of study in the areas of research interest outlined below.

The Ph.D. program specializes in high energy physics and in some aspects of intermediate energy physics (muonic atoms), both experimental and theoretical.

Some of the research in the fields outlined below is being carried out in collaboration with institutions such as the NRC, the University of Chicago, Fermilab, TRIUMF, SLAC, DESY (Hamburg), CERN (Geneva), and others. The current research interests of the department are the following:

Theoretical Physics
Elementary particle physics; field theory, nuclear physics

Intermediate Energy Physics
Muonic atoms, both atomic and nuclear aspects

Experimental High Energy Physics
Study of elementary particle properties and interactions using major high-energy accelerators; research in new instrumentation techniques (for example, streamer chambers, wire spark chambers, transition radiation detectors, etc.)

Medical Physics
Ultrasound: measurement of tissue characteristics, instrumentation and imaging; radiography: uses of X-rays for tissue density measurements

Geochronology
Mass spectrometry, isotope geology; Rubidium-Strontium age determinations; isotopic abundance measurements, isotopic analysis of solids and gases

Master of Science

Admission Requirements

The normal requirement for admission is an honours bachelor's degree with at least high second-class standing in physics or a related discipline. Refer to the general section of this calendar for further details regarding admission requirements.

Program Requirements

Each candidate will choose one of the following optional program patterns:

- Three full courses (of which at least two must be in physics and two must be at the 500 level) and a thesis equivalent to two full courses, which must be defended at an oral examination
- Four full courses (of which at least two must be in physics and three must be at the 500 level) and a thesis equivalent to one full course, which must be defended at an oral examination
- Five full courses (of which at least three must be in physics and four must be at the 500 level); one of these courses must be Physics 75.590.

The candidate must also pass a final comprehensive examination (written or oral, or both).

Normally not more than one credit may be taken from Physics 75.590 or Physics 75.591 in the M.Sc. program.

All students are expected to gain proficiency in mathematical methods, electromagnetism, and quantum mechanics. The courses Physics 75.581, 75.532, and 75.571 are offered for that purpose. Some fourth-year undergraduate courses may be approved for selection by graduate students, up to a maximum of one full course. The selection of courses appropriate to each individual student will be determined by the department.

All candidates are also expected to attend and participate in departmental seminars and colloquia.

Language requirements, prescribed to meet the needs of each student, will be determined by the candidate's supervisor.

Doctor of Philosophy

Admission Requirements

Applicants for admission into the Ph.D. program must ordinarily have a master's degree in physics or a related discipline.

An applicant with an honours bachelor's degree who has achieved an outstanding academic record and, in addition, exhibits very strong motivation and high promise for advanced research, may be admitted to the Ph.D. program directly. Such candidates will be required to complete at least 15 full courses, or the equivalent.

Students who have been admitted to the master's program may be permitted to transfer into the Ph.D. program if they show outstanding academic performance and demonstrate high promise for advanced research during the first year of the master's program.

Admission to the Ph.D. program is provisional; it may be subject to satisfactory completion of a qualifying examination, which is set soon after entry.

Program Requirements

The minimum program requirements for the Ph.D. degree in Physics are the following:

- 10 full courses (or the equivalent), of which at least one non-thesis course must be at the 600 level in physics
- A thesis, equivalent normally to six to seven credits for a theory student, and seven to eight credits for an experimentalist, to be defended at an oral examination
- A comprehensive examination (written and oral) which should be taken at least one year prior to the thesis presentation
- Language requirements, as determined by the candidate's supervisor
- Attendance and participation in departmental seminars and colloquia.

Students who have been admitted to the Ph.D. program on the basis of a 15-course requirement, which normally will require three years of full-time study, must complete the following:

- at least 15 full courses or the equivalent
- A comprehensive examination
- A research thesis equivalent to a maximum of 10 of the 15-course requirement
- The language requirement outlined above.

Graduate Courses*

Graduate students may register in the following courses, subject to the approval of the Department of Physics:

- Physics 75.511F1
Classical Mechanics and Theory of Fields
Hamilton's principle; conservation laws; canonical transformations; Hamilton-Jacobi theory; Lagrangian formulation of classical field theory.

- Physics 75.522W1
Molecular Spectroscopy
Spectra of simple molecules; brief survey of atomic spectroscopy; rotations and vibrations of diatomic and polyatomic molecules and the methods of obtaining information about the geometrical structure of the molecule, and the forces acting between the constituent particles from the observed rotation and vibration spectra; electronic structure of molecules as derived from a study of electronic spectra based mainly on molecular orbital theory. The description will be from the point of view of the experimentalist rather than the theorist.
Prerequisite: Physics 75.477 or Chemistry 65.310.

- Physics 75.532W1
Classical Electrodynamics
Covariant formulation of electrodynamics; Lenard-Wiechert potentials; radiation reaction; plasma physics; dispersion relations.
Prerequisite: Physics 75.437 or equivalent.

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

• Physics 75.561F1
Experimental Techniques of Nuclear and Elementary Particle Physics
The interaction of radiation and high energy particles with matter; experimental methods of detection and acceleration of particles; use of relativistic kinematics; counting statistics; beam optics.
Prerequisites: Physics 75.437, 75.468 and 75.477, 75.478.

• Physics 75.562W1
Physics of Elementary Particles
Description of properties of elementary particles; pions, kaons, and baryons. Conservation laws, invariance principles and quantum numbers. Resonances observed in final state interactions. Three body phase space; Dalitz plot. SU_3 symmetry scheme for classifying elementary particles, mass formulae, and electromagnetic mass differences. Weak interactions; decay of neutral kaons; CP violation in neutral K decays.
Prerequisite: Physics 75.477.

• Physics 75.564W1
Intermediate Nuclear Physics
Properties of the deuteron and the neutron-proton force. Nucleon-nucleon forces, isospin and charge independence. Nuclear models: single particle shell model, shell model with interactions, pairing, quasi-particles, collective models, deformed shell model. Scattering theory: effective range theory, partial wave analysis, phase shifts. Interpretation of n-p and p-p scattering experiments. Interaction of nucleons with electrons. Interaction of nuclei with radiation: multipole fields, transition rates, selection rules, internal conversion.
Prerequisite: Physics 75.468 or equivalent.

• Physics 75.571F1
Intermediate Quantum Mechanics with Applications
Angular momentum and rotation operations; Wigner and Racah coefficients; several and many electron problem in atoms; variational and Hartree-Fock formalism; introduction to second quantized field theory; scattering theory.
Prerequisites: Physics 75.477 and 75.478.

• Physics 75.572W1
Relativistic Quantum Mechanics
Relativistic wave equations. Expansion of S matrix in Feynman perturbation series. Feynman rules. An introduction to quantum electrodynamics without second quantization.
Prerequisite: Physics 75.571.

• Physics 75.581F1
Methods of Theoretical Physics I
This course and Physics 75.582 are designed for students who wish to acquire a wide background of mathematical techniques.
Prerequisite: Permission of the department.

• Physics 75.590T2
Selected Topics in Physics (M.Sc. level)
A student may, with the permission of the department, take more than one selected topic, in which case each full course in Physics 75.590 will be counted for credit. Not more than one selected topic may be taken for credit in any one academic year.

• Physics 75.591F1, W1, S1
Selected Topics in Physics (M.Sc. level)

• Physics 75.599F, W, S
M.Sc. Thesis

• Physics 75.660T2
Advanced Nuclear Physics
Review of nuclear forces; meson theory of nuclear forces; nuclear ground states: Hartree-Fock and Bruckner-Goldstone theories of nuclear matter; in-depth treatment of shell model and collective model; theory of nuclear interactions.
Prerequisites: Physics 75.561, 75.564 and 75.571.

• Physics 75.663W1
Topics in Elementary Particle Physics Phenomenology
This course is intended to develop familiarity with a wide variety of phenomenological concepts of current interest in dealing with elementary particle interactions.
Prerequisites: Physics 75.562, 75.571 and 75.572.

• Physics 75.671F1
Quantum Electrodynamics
Relativistic quantum field theory; second quantization of Bose and Fermi fields; reduction and LSZ formalism; perturbation expansion and proof

of renormalizability of quantum electrodynamics; calculations of radiative corrections and applications.
Prerequisites: Physics 75.511, 75.532, 75.571 and 75.572.

- Physics 75.690T2
Selected Topics in Physics (Ph.D. level)

- Physics 75.691F1, W1
Selected Topics in Physics (Ph.D. level)

- Physics 75.699F, W, S
Ph.D. Thesis

Courses Not Offered in 1983-84

75.553 Reactor Physics
75.582 Methods of Theoretical Physics II

The School

Director of the School: J.E. Neilson
Supervisor of Graduate Studies: Frantisek Fiala

The Master of Computer Science (M.C.S.) degree program is offered jointly by the School of Computer Science, the Department of Systems and Computer Engineering, and the Department of Mathematics and Statistics. It is a joint program with the Department of Computer Science at the University of Ottawa, and hence students are also able to take courses offered there.

Applicants to the M.C.S. program are required to have an honours degree in computer science (or the equivalent). The program is fully described on page 109 of this calendar.

Within the school, the principal research interests of the faculty include the following fields: Programming systems and languages, expert systems, design and analysis of algorithms, information structures, arithmetic complexity, distributed and parallel computing, computing within algebraic structures, combinatorial optimization, artificial intelligence, computer graphics, statistical and syntactic pattern recognition, computerized adaptive learning, database systems, distributed systems, performance and modelling, office automation, business information systems, and computer architecture.

Students in the M.C.S. program have access to an extensive range of computing resources. Campus-wide facilities are provided by a Honeywell Level 66 system with 22 million bytes of main memory and full supporting peripherals and software. In addition, the School of Computer Science has established its own laboratories, which house many eight-bit and 16-bit microcomputers, a LISP machine, and a variety of graphics machines.

Graduate Courses*

- Computer Science 95.501F1
Foundations of Programming Languages
This course will study current topics in the theory and practice of programming language design and implementation. Different styles of languages: imperative, applicative, logic, constraints, object-centred, dataflow, production systems. Abstraction mechanisms; primitives; extensibility; procedural v. declarative semantics; interpretation; compilation; program transformations.

- Computer Science 95.502W1
End-User Facilities
End-user facilities are software/hardware systems which allow a non-programmer to access and manipulate objects stored in a computer system. This course is concerned with the design criteria and algorithms used to construct a variety of end-user facilities. Processors discussed in the course include text editors and formatters; query languages; application program generators and non-procedural programming. Alternative user-oriented programming paradigms are compared and contrasted, such as programming by example, by dialogue, object-oriented programming, menu driven. Some current end-user applications are examined to show programming paradigm; human/machine interface; implementation algorithms and data structures. Typical example systems include VISICALC, QBE, SEQUEL, SBA, SMALLTALK, MODEL II, SCRIPT/SCRIBE/TEX/EMACS/SPF.

- Computer Science 95.503W1
Principles of Distributed Computing
Formal models; semantics of distributed computations; theoretical issues in design of distributed algorithms; computational complexity; reducibility and equivalence of distributed problems. Related topics: systolic systems and computations, oligarchical systems and control mechanisms.

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

• Computer Science 95.504F1
Topics in Arithmetic Complexity
Models of computation; preconditioning and polynomial evaluation; bilinear forms and tensor rank; matrix multiplication; lower bounds for selected problems; parallel algorithms and parallel complexity.
Prerequisite: Computer Science 95.484 or equivalent.

• Computer Science 95.505F1
Automata Models of Learning Systems
This course will introduce the students to computerized adaptive learning. Learning models in mathematical psychology will be discussed. Mathematical tools such as Markov chains and the solution of difference equations will be reviewed. The heart of the course will involve deterministic and stochastic learning automata, variable structure stochastic automata, operation in random environments, norms of learning, linear and nonlinear learning schemes, convergence problems, and discretized automata with ergodic and non-ergodic properties. Applications of learning automata in file allocation, game playing, path finding, optimization and decision making will be discussed.
Prerequisite: Mathematics 70.260 or 70.350, or Engineering 94.553, or equivalent.

• Computer Science 94/95.507W1
Expert Systems
Expert systems is a special field of artificial intelligence dealing with the design and construction of programs that provide information at the level of an "expert" in a specific area of interest. The existing expert systems and the current research in this area will be surveyed. Typical expert systems deal with medical diagnosis, computer system configuring, and programmer's assistants. Moreover, the systems are generally implemented using one of two paradigms: the rule-based approach or the actor-based approach. Both approaches will be considered in depth. Prototype software implementations are expected. Students will be expected to have a strong programming background, and to be able to familiarize themselves with LISP within the first week should they not already know it.

• Computer Science 95.590F1, W1, S1
Selected Topics in Computer Science
Selected topics, not covered by other graduate courses, will be offered. Details will be available at the time of registration.

• Computer Science 95.591F1, W1, S1
Directed Studies
A course of independent study under the supervision of a member of the School of Computer Science, and open only to students in the M.C.S. program.

• Computer Science 95.592F1, W1, S1
Project

• Computer Science 95.592F1, W1, S1
Project

• Computer Science 70/94/95.595 F, W, S
M.C.S. Thesis

Departmental Program Descriptions and Details of Courses

Faculty of Social Sciences

Dean: D.P. Forcese

The School

Director of the School: A.J. Bailetti

The School of Business does not at present offer a graduate degree, but its courses are available to graduate students registered with other departments and schools. Business faculty also supervise graduate research.

Currently, the school offers six courses at the graduate level. The student's background, as well as the particular degree which is being sought, will influence the selection of courses. Business courses can be of particular interest to graduate students in Canadian studies, economics, engineering, international affairs, and public administration.

Students wishing to register in business courses should seek guidance and approval both from the School of Business and the department in which they are registered for their degree.

Graduate Courses*

• Management Studies 42.503W1
Information Resource Management
Examination of the information resource management function as it is found in modern business and government organizations. The course illustrates information resource management tools, including data analysis, building a data dictionary, access controls, building the corporate data model, and structured analysis and design.
Prerequisite: 94.573 or permission of the school.
D.A. Thomas.

• Accounting 41.510F1
Management Accounting
An introduction to the underlying assumptions and basic principles of accounting, and an examination of the uses of accounting information by management. Topics include income measurement, asset valuation, financial statement analysis, cost systems, control reports, operating budgets, capital expenditure decisions, and alternative choice problems.
(Also offered as Administration 50.510)

• Management Studies 42.512F1
The Theory of Finance
An examination of the continuing evolution of the theory of valuation of capital assets under uncertainty, pricing of contingent claims, and the principles of arbitrage theory; the relationships between these contemporary approaches to valuation and the more traditional methods of the valuation of corporate claims. Examination of financial decisions from the perspective of information theory.
Prerequisite: Honours B.A. in Economics, Bachelor of Commerce, or permission of the school.

• Management Studies 42.514W1
Portfolio Theory and Management
The first part of the course examines the concept of an efficient market hypothesis in its various forms. Students will be expected to carry out an efficient market test, using data from a specific segment of the Canadian capital market. The second part of the course reviews the various approaches to the management of fixed income securities (liquidity-investment, spaced maturity and barbell approaches) and of equities (mechanical, asset-by-asset, buy and hold, SML) within a consistent theoretical framework encompassing return, risk, and liquidity.
Prerequisite: Commerce 42.512 or permission of the school.
J.R. Callahan.

• Management Studies 42.518W1
Marketing for Non-Profit Organizations
Examination of the concepts of marketing relative to public demand, and the market for social goods and services. Contemporary marketing approaches and practices are analyzed and applied to purposes, programs, and environments of government agencies and departments, educational institutions, charities, and other public and social services.
N.G. Papadopoulos.

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

• Management Studies 42.590W1
Tutorials/Directed Studies in Business
Tutorials or directed readings in selected areas of business, involving presentation of papers as the basis for discussion with the tutor. A requirement for the course may be participation in an advanced commerce course at the undergraduate level.
W.M. Lawson and others.

The Department

Chairman of the Department: A.L.K. Acheson
Supervisor of M.A. Studies: D.A. Smith
Supervisor of Ph.D. Studies: D.G. McFetridge
Director of Joint Doctoral Studies Program with the University of Ottawa: R.G. Bodkin

The Department of Economics offers programs of study and research leading to the M.A. and Ph.D. degrees.

Graduate students in economics undertake a thorough review of economic theory, together with an analysis of the Canadian economy, its institutions and history, and the working of public policy. Stress is placed on the understanding and application of quantitative methods to all aspects of economics. Although the programs are generally oriented towards policy problems, there is considerable opportunity for the development of specialized interests.

The main areas of specialization within the department include the following:

- Industrial Organization
- Public Finance
- Money and Trade
- Urban and Regional Economics
- Economic Theory
- Quantitative Methods

Qualifying-Year Program

Applicants who have a general (pass) bachelor's degree, or who otherwise lack the required undergraduate preparation, may be admitted to a qualifying-year program designed to raise their standing to honours status. If successful, they may be permitted to proceed to the master's program the following year.

Refer to the general section of this calendar for details of the regulations governing the qualifying year.

Master of Arts

Admission Requirements

The normal requirement for admission to the master's program is an Ontario honours B.A. (or the equivalent) in Economics, with at least high second-class standing.

Applicants are expected to have had adequate preparation in statistics and mathematics. Credit in the following two undergraduate courses (or their equivalents) will be accepted: Economics 43.220: Statistical Methods in the Social Sciences, or Mathematics 69.107: Elementary Calculus and Mathematics 69.127: Topics in Calculus and Algebra. Students who do not satisfy the statistics requirement will be asked to take Economics 43.592: Empirical Methods, prior to proceeding to Economics 43.505: Econometrics. Students with inadequate mathematical backgrounds will be required to enrol in Economics 43.593: Mathematics for Economists.

The department may require certain applicants to write the Graduate Record Examination aptitude test and the Advanced Test in Economics offered by the Educational Testing Service.

Program Requirements

All master's students in economics are required to complete the following courses:

Economics
43.501 Advanced Microeconomic Theory
43.502 Advanced Macroeconomic Theory
43.505 Econometrics
43.506A Comprehensive Tutorial — Microeconomics
43.506B Comprehensive Tutorial — Macroeconomics

The tutorials serve to prepare candidates for the written M.A. comprehensive examination. Details of this examination are outlined below.

In addition, each candidate must select and complete one of the following:

- A thesis, equivalent to 1½ credits and approved course(s) for one credit
- Approved courses for 2½ credits, one of which may be selected from among those offered in a related discipline, with permission of the department, through the supervisor of M.A. studies.

Comprehensive Examinations

Master's candidates in economics must undertake a written comprehensive examination to demonstrate their knowledge of economic theory and its policy implications. This examination is prepared by the instructors of the comprehensive tutorials in consultation with the supervisor of M.A. studies.

Academic Standing

A grade of B- or better must normally be obtained in each course counted towards the master's degree. A candidate may, with the recommendation of the department, be allowed a grade of C+ or C (but not C-) in one full course or each of two half-courses.

Doctor of Philosophy

The Carleton Ph.D. program is principally concerned with Canadian economic policy.

The course content of the program must be undertaken on a full-time basis; completion of the overall Ph.D. requirements entails a minimum of two years of study.

In July, 1981, a new Ph.D. program in Canadian economic policy and economic development was launched, offered jointly by the combined economics departments of Carleton University and the University of Ottawa. Details of that new program follow on page 154 of this calendar.

Students registered in the Ph.D. program at Carleton prior to the fall of 1981 will continue to follow the requirements and courses as outlined up to page 154 of this calendar.

Admission Requirements

The normal requirement for admission into the Ph.D. program is a master's degree (or the equivalent) from a recognized university, with high second-class standing. The department may require certain applicants to write a comprehensive entrance examination.

Transfer from Master's to Ph.D. Program

A student who shows outstanding academic performance, and who demonstrates high promise for advanced research during the master's program may, subject to meeting the requirements below, be permitted to transfer into the Ph.D. program without completing the M.A. program.

- The student will have completed Economics 43.501, 43.502, 43.505, plus an additional four half-courses at the graduate level.
- The student must make formal application to the Graduate Studies Committee at least one month before the beginning of the term in which he/she wishes to begin the Ph.D. program.
- Students permitted to transfer into the Ph.D. program will be required to complete the equivalent of 11½ courses.

Program Requirements

Ph.D. candidates are expected to have or acquire proficiency in mathematics and statistics; this requirement must be satisfied before proceeding with the program.

Doctoral candidates would usually complete:

Economics

43.600 Economic Theory I: Microeconomics
43.601 Economic Theory II: Macroeconomics
43.602 Analysis of Microeconomic Policy
43.603 Analysis of Macroeconomic Policy
43.606 Economic Models and Policy Applications
43.611 Workshop in Economic Policy

- Four other graduate half-courses (or the equivalent) in economics; with the permission of the department, through the supervisor of Ph.D. studies, one full course may be selected from a related discipline.
- A formal dissertation, equivalent to five full-course credits, which must be defended at an oral examination
- Three written comprehensive examinations (theory, policy, and an optional field).

Academic Standing

Doctoral students must normally obtain a grade of B- or better in each course counted towards the degree.

Qualifying-Year Courses*

• Economics 43.590F1
Microeconomic Theory
This course is required for qualifying-year students whose preparation in microeconomic theory is judged to be inadequate.

• Economics 43.591W1
Macroeconomic Theory
This course is required for qualifying-year students whose preparation in macroeconomic theory is judged to be inadequate.

• Economics 43.592F1
Empirical Methods
Principles of statistical theory, probability, testing, and introduction to regression analysis. Designed for those judged deficient in undergraduate statistical training.

• Economics 43.593F1
Mathematics for Economists
This course provides an introduction to the use of mathematical techniques in economics. Topics in optimization, such as Lagrangean multipliers and second order conditions, will be emphasized. Applications of these tools to various parts of economic theory will be presented.

• Economics 43.594F1, W1, S1
Qualifying-Year Tutorial
A tutorial for qualifying-year students whose program includes the full slate of qualifying-year core courses (microeconomic theory, macroeconomic theory, empirical methods, and applied economics).

• Economics 43.595F1, W1, S1
Applied Economics

• Economics 43.597F1, W1, S1
Qualifying Year Directed Readings

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

Graduate Courses*

Enrolment in the graduate courses requires the permission of the department, through the supervisor of graduate studies.

• Economics 43.501F1
Advanced Micro-Theory
An examination of the theories of the behaviour of individual economic agents: consumers and producers and their relation to the theories of price and distribution. Students are introduced to the controversies in the study of individual economic behaviour.

• Economics 43.502F1
Advanced Macro-Theory
Macroeconomic theory and its implications for economic policy are surveyed in this course, comparing alternative approaches for a variety of topics.

• Economics 43.505F1
Econometrics
Estimation and testing of the general linear model, with emphasis on problems such as autocorrelation, heteroscedasticity, muticollinearity, and problems due to distributed lags and errors in variables. Introduction to simultaneous equations systems, identification, and estimation.
Prerequisites: Economics 43.220, 43.592, or equivalent.

• Economics 43.506W1, S1
Comprehensive Tutorial
Students must register in the microeconomics and macroeconomics tutorials in either the winter or spring term.

• Economics 43.507F1, W1, S1
Directed Readings
Prerequisite: Permission of the department.

• Economics 43.508F1, W1, S1
Special Topics
Prerequisite: Permission of the department.

• Economics 43.509F1, W1, S1
Directed Research
At least one paper will be required from a student enrolled in any one of these courses.
Prerequisite: Permission of the department.

• Economics 43.511F1
Canadian Economy I
A detailed examination of aspects and problems of the Canadian economy. A variety of topics may be discussed, including the economic development of Canada, the structure of the current national and regional economies, industrial organization, factor market operation, income distribution, the role of international trade and capital flows, and the stability of the economy.

• Economics 43.512W1
Canadian Economy II
Economic theory applied to the workings of the Canadian economy. Empirical estimation of various aspects of factor market operation, production, distribution, and aggregate economy. Participants are expected to prepare and present papers for discussion.

• Economics 43.521F1
History of Economic Thought I
The crucial achievements in economic theory and doctrine in the nineteenth and twentieth centuries are studied. Special emphasis is given to the interrelationship between the social environment and economic thought — especially to the role of economics in the development of the national state and international institutions.

• Economics 43.522W1
History of Economic Thought II
A continuation of 43.521.
Prerequisite: Economics 43.521 or permission of the department.

• Economics 43.525W1
Mathematical Economics
A synthesis of some important topics in economic theory, with almost exclusive use of mathematical models. Included are general equilibrium of the firm and/or the household, and related matters; general equilibrium of exchange and production; stability of equilibrium; linear programming, games and the theory of the firm; selected topics in economic dynamics; value theory; social welfare functions; optimizing techniques and public policy.
Prerequisite: Mathematics 69.201, Economics 43.200, 43.210, or equivalent.
May be taken by senior undergraduates, with permission of the department.

• Economics 43.531F1 (ECO6140; 6540)
Firms and Markets
An examination of theories pertaining to industrial organization, and their application to particular industries in Canada and elsewhere by way of empirical studies.

• Economics 43.532W1 (ECO6141; 6541)
Competition Policy
An examination of the rationale and application of competition policy with particular attention to the Canadian economy.

• Economics 43.533S1 (ECO6142; 6542)
Regulation and Public Enterprise
An examination of regulation and public enterprise as alternative approaches for influencing industry conduct and performance.

• Economics 43.534W1
Law and Economics
This is a course in the interrelationship of law and economics, emphasizing the concepts of transaction costs and property rights. Economic theory will be used to analyze a variety of topics, ranging from the allocative effects of alternative property rights structures to contract, tort, and nuisance law. Special attention will be given to applied problems, such as the economics of crime, pollution, pay television, and eminent domain.
Prerequisite: Economics 43.420 or equivalent.

• Economics 43.536F1
Comparative Economic Systems I
An analysis of the structure and functioning of economic systems. Some discussion of the notion of an economic system and of the criteria used to evaluate the performance of systems.

• Economics 43.537W1
Comparative Economic Systems II
A continuation of 43.536.
Prerequisite: Economics 43.536 or permission of the department.

• Economics 43.541F1 (ECO6130; 6530)
Public Economics: Expenditure
A discussion of the role of government expenditure, both in theory and with reference to the Canadian economy.

• Economics 43.542W1 (ECO6131; 6531)
Public Economics: Taxation
An analysis of the effects of various forms of taxation on economic performance.

• Economics 43.543W1 (ECO 6133, 6533)
Public Choice
Democracy, bureaucracy, and economic policy. The public choice of fiscal constitutions, tax shares, and equity rules; voting coalitions and income distribution; the public provision of private goods; public sector size, fiscal illusion, and taxpayer revolts.

• Economics 43.544W1 (ECO6132; 6532)
Fiscal Federalism
This course examines the economic aspects of federalism, including efficiency, redistribution, consideration of a federal system of government, intergovernmental grants, and problems of stabilization policy in a federal context.

• Economics 43.545W1
Theoretical Welfare Economics
A rigorous treatment of the theoretical foundations of welfare economics. An introduction to axiomatic social choice theory, with emphasis on the determination of collective choice rules from individual choice rules, the various types of measurability and comparability assumptions and impossibility results of the Arrow-type.

• Economics 43.547W1
Project Evaluation
An analytical treatment of the principles of project evaluation and their applications.
Prerequisite: Economics 43.501 or permission of the department.

• Economics 43.550F1 (ECO6170; 6570)
Theory of Economic Development
This course will deal with the main theoretical approaches in the development and underdevelopment literatures in relation to historical, economic, social, ecological, and political dimensions of the development process in the Third World.
Prerequisite: Economics 43.421.

• Economics 43.551F1
Economic Dynamics: Business Cycles
An analysis of the nature and causes of fluctuations in income, prices, and employment. Short-run dynamic models arising from multiplier-accelerator and other economic processes will be examined. Cycle simulation, forecasting, stability conditions, anti-cyclical policy, and the problems of maximizing growth without cycles will be discussed.

• Economics 43.552W1
Economic Growth
An examination of modern theories of economic growth: constraints of renewable and non-renewable resources; trade-offs between economic growth and environmental decay; problems of inter- and intra-generational income distribution.

• Economics 43.553W1
Stabilization Policy
An examination of policies aimed at achieving internal and external stability. The implications of economic growth for stabilization policies will be discussed.
Prerequisite: Economics 43.502.

• Economics 43.554W1 (ECO6171; 6571)
Policies for Economic Development
Policies and strategies for socioeconomic development; policy implications of various theories of development and underdevelopment; the role of government policy in industry, rural development, environment, trade, science and technology, health, and education.
Prerequisite: Economics 43.550.

• Economics 43.555F1 (ECO6172; 6572)
The Economics of Development
An examination of some key problems of development in the Third World, including theoretical analysis, and policy formulation and evaluation. Topics considered may include some of the following: dualistic models of development, choice of production technique, income distribution, choice of organizational form, intersectoral resource allocation, etc.
Prerequisites: Economics 43.590 and 43.591 or equivalents.

• Economics 43.561F1 (ECO6160; 6560)
International Trade Theory and Policy
International trade theory and its implications for economic policy are examined, with emphasis on topics such as determinants of trade and specialization, gains from trade and commercial policy, international factor mobility, growth, and development.

• Economics 43.562W1 (ECO6161; 6561)
International Monetary Theory and Policy
International monetary theory and its implications for economic policy are examined, with emphasis on topics such as sources of equilibrium and disequilibrium in the balance of payments, balance-of-payments adjustment under fixed versus flexible exchange rates, international capital movements, and recent issues in the international monetary system.

• Economics 43.563W1 (ECO6162; 6562)
Topics in International Economics
An examination of key topics in international economics, including theoretical analysis, quantitative methods and policy formulation, implementation, and evaluation.
Prerequisite: Economics 43.561 or 43.562.

• Economics 43.567F1
Monetary Theory and Policy I
This course is designed to provide the analytical tools of monetary theory and policy: the effects of monetary change on economic activity, the foundations of monetary theory, and classical, Keynesian, and modern monetary analyses are discussed. Also examined are the policy implications of the "optimum quantity of money", various estimates of money supply and demand, and difficulties of implementing policy in open and closed economies and in a growth context.

• Economics 43.568W1
Monetary Theory and Policy II
A continuation of 43.567.
Prerequisite: Economics 43.567 or permission of the department.

• Economics 43.571W1
Advanced Econometrics
Selected topics from estimating and testing the regression and simultaneous equation models are analyzed. The main topics include maximum likelihood estimation, statistical analysis of residuals, autoregressive and other time-series models, multivariate regression model, and elements of asymptotic statistical theory within the context of the simultaneous equation model.
Prerequisites: Economics 43.485, 43.505, or equivalent.

• Economics 43.572W1
Applied Econometrics
A discussion of the major problems encountered in applying the tools and techniques of econometric methods to statistical data for economic analysis and forecasting. Some selected topics and papers from the applied econometric literature are critically analyzed and appraised.
Prerequisite: Economics 43.505 or equivalent.

• Economics 43.581F1 (ECO6150; 6550)
Regional Analysis
Regional economic disparities in Canada, and theories and public policy relating thereto; consideration will be given to the concept of regions, location of industry and industrial structure, and to growth determinants. Various aspects of policy designed to improve the fortunes of the less-prosperous regions will be examined.

• Economics 43.582W1 (ECO6151; 6551)
Urban Analysis
An examination of the economic properties of urban areas. Attention will be focused on the macro-dynamics of urban development, together with the micro-statics of the equilibrium properties of the urban land market. The impact of public policy in Canada on urban areas will be assessed in the light of the formal analysis.

• Economics 43.583F1 (ECO6152; 6552)
Regional Policy
Analysis of policies directed toward less-prosperous regions.

• Economics 43.584W1 (ECO6153; 6553)
Urban Policy
An assessment of public policy in Canada on urban areas.

• Economics 43.599F3, W3, S3
M.A. Thesis

• Economics 43.600F1 (ECO7922)
Economic Theory I: Microeconomics
This course includes lectures and seminars on selected aspects of topics such as consumer behaviour, producer behaviour, market structures, income distribution, and general equilibrium. Attention will be given not only to descriptive theory, but also to implications for economic policy.
Prerequisites: Economics 43.501 and 43.543, or equivalents.

• Economics 43.601F1 (ECO7920)
Economic Theory II: Macroeconomics
Lectures and seminars on critical aspects of consumption, investment, government expenditure, taxation, external economic equilibrium, money, prices, and employment stabilization and economic growth. Emphasis will be placed on policy implications.
Prerequisites: Economics 43.502 and 43.553, or equivalents.

• Economics 43.602W1
Analysis of Microeconomic Policy
An examination and evaluation of microeconomic policies. Various aspects of policy issues are analyzed. These will be drawn from such areas as industrial economic policy, renewable and non-renewable resources, communication and transportation, regional economic policy, social economic policy, and operations of the labour market.

• Economics 43.603W1
Analysis of Macroeconomic Policy
An examination and evaluation of macroeconomic policies. Policy issues are discussed, alternative solutions formulated, and their outcomes considered. Attention will focus upon such areas as incomes policy, taxation and budgetary policy, central bank operations, exchange rate manipulation, and commercial policy.

• Economics 43.606F1 (ECO7930)
Economic Models and Policy Applications
Selected topics in the literature of econometric model building, and consideration of their relevance to the design of economic policy. Topics include aggregation bias, causality and recursivity, and analysis of dynamic properties of reduced forms, among others. Also included is a survey and comparative analysis of existing Canadian macroeconometric models. A detailed examination of one Canadian model will be made, and students will have the opportunity to conduct policy simulations with it.
Prerequisite: Economics 43.505 or equivalent.

• Economics 43.607W1 (ECO7900)
Research Methods in Economics
Philosophy of science and scientific methods; a critique and an appraisal of the basic postulates of the classical, neo-classical, Marxian, Keynesian, and post-Keynesian modes of theorizing in relation to the following three principles of scientific inquiry: rigor, realism, and relevance; the concepts of system and model; methods and purposes in economic model-building and policy implications; the concepts of structure, function, structural change, and evolution; structural stability and the theory of catastrophes in economics.
Prerequisites: Economics 43.501 and 43.502.

• Economics 43.608F1
Topics in Advanced Micro-Theory

• Economics 43.609W1
Topics in Advanced Macro-Theory

• Economics 43.611F1, W1, S1 (ECO7010; 7011; 7012)
Workshop in Economic Policy
Forums in which graduate students and faculty can work together on policy questions. Workshops will be held on urban and regional economics, economic organization and development, money and trade, public economics, and quantitative methods.

Doctoral students are required to join two workshops and present a paper to one of these groups.

• Economics 43.670F1, W1, S1 (ECO7980)
Reading Course in Canadian Economic Policy and Economic Development

• Economics 43.690F1, W1, S1 (ECO7990)
Ph.D. Tutorial
The student must register in any *two* terms in the Ph.D. tutorial.

• Economics 43.699F10, W10, S10 (ECO9999)
Ph.D. Thesis

The courses listed below (up to and including 43.697) indicate the areas in which members of the department are prepared to supervise directed reading, research, and seminars. Not all the courses will necessarily be offered in any one year. Permission of the department is required.

• Economics 43.630F1
Industrial Organization I

• Economics 43.631W1
Industrial Organization II

• Economics 43.640F1
Public Finance I: Advanced Taxation Theory

- Economics 43.641W1
Public Finance II: Advanced Expenditure Theory

- Economics 43.660F1
Theory of International Trade

- Economics 43.661W1
Monetary Theory

- Economics 43.662W1
Balance of Payments and International Monetary Theory

- Economics 43.680F1
Urban and Regional Economics I

- Economics 43.681W1
Urban and Regional Economics II

- Economics 43.696F1, W1, S1
Selected Advanced Topics

- Economics 43.697T2
Selected Advanced Topics

Joint Doctoral Program

The doctoral program in Canadian economic policy and economic development, offered jointly by the Departments of Economics at Carleton University and the University of Ottawa, was launched in July, 1981.

This new Ph.D. program stresses the application of economic theory to the analysis of Canadian economic policy and economic development. Five areas of specialization are available for intensive study and thesis research: public economics, industrial organization, regional and urban economics, international economics, and economic development. The program of courses and thesis guidance, drawing upon the faculty of the two departments, will encompass course requirements, policy-oriented workshops, comprehensive examinations, and a thesis. Students who have achieved at least high second-class standing at the M.A. level in economics, or who have equivalent training, may be admitted to the joint Ph.D. program. They will be required to take one half-course at the graduate level in Canadian or North American economic history (or the equivalent) if they have not already taken such a course at the graduate level. Students are also expected to have, or to acquire proficiency in, mathematics and statistics before proceeding with the program.

Students admitted to the joint Ph.D. program are required to complete three compulsory half-courses: microeconomic theory, macroeconomic theory and models for economic policy, or research methods in economics. Students are required to take three half-courses in each of two fields of specialization. Credit may be given for previous graduate courses in either of the chosen fields. Courses in the fields of specialization will be:

Public Economics
- Public Finance: Expenditure
- Public Finance: Taxation
- Topics in the Theory of Public Economics
- Economic Policy in a Federal State

Industrial Organization
- Firms and Markets
- Competition Policy
- Regulation and Public Enterprise

Regional and Urban Economics
- Regional Economics
- Urban Economics
- Regional Policy
- Urban Policy

International Economics
- International Trade Theory and Policy
- International Monetary Theory and Policy
- International Aspects of Development

Economic Development
- Theory of Economic Development
- Economic Development Policies
- International Aspects of Development

Students must also attend four half-courses in two of the three workshops being offered by the two departments, those chosen being central to dissertation interest and research. They will receive credit for only two half-courses for those two terms in which they make their presentation to the workshops. The workshops are:

- Government and the Market Place
- Evaluation of Public Budgets
- Canada in the World Economy

Each student will attend a full-course (or two half-courses) Ph.D. tutorial, will be required to write and defend orally three comprehensive

examinations (theory, policy, field), and will be required to write and defend orally a Ph.D. dissertation. Doctoral students will be required to obtain a grade of B- or better in each of the courses (required, field of specialization, workshop, tutorial) credited towards the degree.

Further details about this joint Ph.D. program may be obtained by writing to the director of doctoral studies, Joint Doctoral Program in Economics, either at the Department of Economics, Carleton University, or at the Department of Economics/Département de Science Economique, University of Ottawa.

Department of Geography

The Department

Chairman of the Department: T.P. Wilkinson
Departmental Supervisor of Graduate Studies: John Clarke

The Department of Geography offers programs of study and research in physical and human geography leading to the degree of Master of Arts. Inquiries are welcomed about interdisciplinary topics and post-M.A. study that may be undertaken in co-operation with other departments of the University.

The program of study for each student is based on the interests of the individual. An advisory committee, consisting of the student's research supervisor and at least two other members of the department, is set up to monitor and provide guidance for the student's research. The department has excellent laboratory facilities for the geotechnical study of near surface processes, and the physics, chemistry, and thermodynamics of earth materials. There is a large map library and a well-equipped cartography laboratory as well as a minicomputer/plotter/digitizer. These facilities are supported by a highly qualified full-time staff in laboratory instrumentation, cartography, and data processing. The location of the University in the nation's capital offers the student access to important resources, such as the National Library, the National Archives, and Statistics Canada.

Currently, the main areas of specialization in the department are the following:

Physical Geography and Geotechnical Science
Studies of natural processes close to earth's surface, especially as they apply to environmental management: climate-ground interaction, micrometeorology in frozen ground regions, the chemical, physical, and thermodynamic properties of soils and sediments, and hydrology and sedimentology of fluvial processes in glacial and periglacial environments. Current emphasis in investigations of geotechnical concern are cold region phenomena, soil-water relations, and stability of marine clays.
(J.P. Johnson, M.W. Smith, J.K. Torrance, T.P. Wilkinson, P.J. Williams)

Rural and Resource Development
Identification of development processes; the interplay of population, political, demographic, and socioeconomic variables with land resources and spatial factors. Frontier settlement, rural-urban evolution in developing countries, and recreational land use are of particular interest.
(D.M. Anderson, D.B. Knight, G.C. Merrill, M.W. Smith, D.R.F. Taylor, J.K. Torrance, A.I. Wallace)

Cultural, Historical, and Political Geography
The effect of cultural attitudes and techniques on the evolution of human groups, their organization of earth's space and resources in past and present landscapes; cross-cultural studies, focusing particularly on the role of political and religious authority and ideology in changing the physical environment; concepts of territory and territoriality; and perception of the environment and settlement history.
(John Clarke, D.B. Knight, G.C. Merrill, D.R.F. Taylor)

Economic and Urban Geography
Identification of basic spatial regularities in the socioeconomic organization of human activity. Spatial decision making and spatial dynamics as exemplified in the internal structure of urban places, industrial location, regional organization, and characteristics of transport systems.
(David Bennett, D.M. Ray, J.E. Tunbridge, A.I. Wallace, Mark Rosenberg)

Cartography and Remote Sensing
Research and course work in both cartography and the application of remote sensing to the solution of geographical problems is available within the department.
(M.F. Fox, D.R.F. Taylor, J.P. Johnson)

The opportunity for wider experience in cartography may be obtained through arrangements by which a student may take for credit at Carleton University one or more courses in cartography offered by the Department of Geography, Queen's University. The principal areas of focus are map design and history of cartography at Queen's, and applied aspects of computer cartography at Carleton.

Students following the co-operative cartography program may register in either department, and will follow the normal regulations and requirements of their university of registration. When appropriate for students in the co-operative program,

representatives from both universities may be members of a student's thesis examining board.

Financial aid for transport between cities will be provided by the home department.

Systematic interests of departmental members are applied to regions of special interest: Africa (Knight, Taylor); Southwest Pacific (Knight); Arctic and Subarctic (Smith, Johnson, Williams); Canada (Anderson, Clarke, Wallace, Knight).

Qualifying-Year Program

Applicants with exceptional promise who have a general (pass) bachelor's degree, or who have substantially less than the honours B.A. in Geography may be admitted to a qualifying-year program. To be considered for admission into the master's program, qualifying-year students must attain at least an overall high second-class standing in their qualifying-year geography courses. The general section of this calendar provides details about the regulations governing the qualifying year.

Master of Arts

Admission Requirements

The normal requirement for admission into the master's program is an honours B.A. or B.Sc. in Geography with at least high second-class standing. Applicants who have taken their undergraduate degree in the physical or natural sciences or engineering, as well as in physical geography, will be considered if their research interest coincides with those of the department. Applicants in human geography may be accepted from related fields if their proposed research is closely related to faculty research experience. Students with academic deficiencies may be required to take additional courses.

Program Requirements

The M.A. in Geography is expected to take 12 months, but field work may necessitate some extension. All master's students in geography are required to complete a minimum of five full courses or the equivalent, including an M.A. thesis (equivalent to two full courses) which must be successfully defended at an oral examination. All students are required to have a reading knowledge of the language considered essential to their research.

Graduate Courses*

In addition to the selection of courses offered by the department, graduate students in geography are encouraged to consider, in partial fulfilment of their degree requirements, appropriate courses offered in such disciplines as biology, chemistry, economics, engineering, geology, history, international affairs, physics, political science, and sociology.

Courses at the University of Ottawa may also be taken for credit in a Carleton M.A. program; permission of departments in both universities is required.

The following courses, normally offered annually, are scheduled for 1983-84:

- Geography 45.500F1

Graduate Research Seminar
The application of scientific principles of investigation to contemporary research in geography. This course is suitable for students regardless of their specialization.

- Geography 45.517F1, W1, S1

Field Study and Methodological Research
Field acquisition and analysis of geographic material; supervised field observations and methodology. (Individual or group basis, by special arrangement.)
Co-ordinator: John Clarke.

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

• Geography 45.520F1
Problems of Development in Africa
(Also offered as International Affairs 46.563)
D.R.F. Taylor.

• Geography 45.532F1
Soil Thermal and Hydrologic Properties
Instrumental techniques for investigation of hydrological and thermal processes near the earth's surface, laboratory instrumentation, and analysis of laboratory and field procedures in geotechnical science.
(Alternates with Geography 45.530)
P.J. Williams.

• Geography 45.533W1
Periglacial Geomorphology
Permafrost, its distribution and significance, seasonal ground freezing, ground thermal regime, physical, thermodynamic, and geotechnical properties of freezing and thawing soils, terrain features ascribable to frost action, and solifluction and patterned ground.
P.J. Williams.

• Geography 45.540F1
Territory and Territoriality
Integrated examination of themes: territorial organization and sense of place; authority, ideology, and landscape; political interference in a cultural world. Evolution of the Western meaning of territory is examined against contrasting concepts in Canada and the Third World, especially Africa. Significance of territory and territoriality: their impact on restructuring of space, land claims, conflict, and processes of development.
D.B. Knight.

• Geography 45.543F1
Selected Concepts in Cultural Geography
In 1983-84 the primary focus will be the geographical dimensions of selected plural societies.

• Geography 45.545W1
Problems in Historical Geography
Philosophical and methodological approaches in geography, history, and historical geography, emphasizing the use of primary documents, model building, and statistical methods as they relate to the historical geography of Canada.
John Clarke.

• Geography 45.550W1
Spatial Dynamics of Urban and Regional Systems I
A review of recent theoretical and methodological debate in the field, followed by concentration on city-system development, the behaviour of multilocational enterprises, and the nature of regional economic disparities and policy responses.
Mark Rosenberg.

• Geography 45.555W1
Tourism and International Development
The nature and effect of tourist development in various parts of the world, and the role of tourism in developed and developing countries.
G.D. Taylor.

• Geography 45.570F1
Problems of Development in Arctic and Subarctic Environments
Research seminar on specific problems in Canada's northland. Experience from other parts of the world will be incorporated when appropriate.

• Geography 45.572W1
Issues in Canadian Resource Development
An overview of Canadian natural resource problems and prospects, concentrating on agriculture, forestry, energy, minerals, and offshore resources.

• Geography 45.579F1
Research and Development in Recreational Geography
A seminar which examines research themes and developments in Canadian recreational land use: evaluation, planning, and management.
D.M. Anderson.

• Geography 45.580W1
Spatial Information Systems and Computer Cartography
The concepts and problems involved with spatial information systems, especially those with a mapping component.
D.R.F. Taylor.

• Geography 45.581
Seminar in Map Design
A seminar on selected problems in the design, construction, and appreciation of maps.
(Offered at Queen's University as 38.850)

• Geography 45.582
Seminar in Historical Cartography
A seminar on selected problems in historical cartography.
(Offered at Queen's University as 38.877)

• Geography 45.590F1, W1, S1
Graduate Tutorial
Tutorial, directed reading or research, offered on an individual basis, to meet specific program needs; may be taken in one of the areas of specialization of the department.
Co-ordinator: John Clarke.

• Geography 45.599F4, W4, S4
M.A. Thesis
Thesis supervision will be given in all areas of specialization of the department, as listed in the calendar section identifying departmental specializations.
Co-ordinator: John Clarke.

Courses Not Offered in 1983-84

45.530 Soil Thermal and Hydrologic Regimes
45.534 Aspects of Clay Mineralogy and Soil Chemistry
45.536 Floating Ice Studies
45.537 Soil Resources
45.546 Geographical Insights to Canadian Problems
45.551 Spatial Dynamics of Urban and Regional Systems II

The Norman Paterson School of International Affairs

The School

Director of the School: B.W. Tomlin
Associate Director: M.A. Molot

The Norman Paterson School of International Affairs, established in 1965 with the generous support of the Honourable Norman M. Paterson, offers a program of studies leading to the M.A. degree.

The program focuses on three themes: global and regional political economy, development studies, and conflict analysis. The program affords students the opportunity to focus on Canada in international affairs through specialized courses related to each of these themes. Attention is also paid to the role of international institutions, the foreign policies of other countries, and to selected regional studies. The school maintains close co-operation with the Institute of Soviet and East European Studies, and with committees designed to encourage and co-ordinate faculty and student interests in Africa, Asia, and Latin America.

A specialized resource centre is located in the school and is staffed by a full-time information specialist. Students and faculty have access to a broad range of current bibliographic materials, using the resources of the national capital area as well as on-line computerized bibliographic services in foreign policy and international affairs. The school also participates in the Social Science Data Archives at Carleton, and students have access to a full range of data sets available from the Inter-University Consortium for Political Research, as well as the Canadian Institute of Public Opinion poll data and the Human Relations Area Files.

Qualifying-Year Program

Admission Requirements

The qualifying-year program is designed to enable students with at least high second-class standing, but with an inadequate background in the disciplines relevant to the M.A. program, to make up deficiencies. Candidates with a general (pass) bachelor's degree, in a discipline closely related to international affairs, will be required to take five qualifying-year courses before being eligible to enter the master's program. Those with an honours bachelor's degree in an unrelated discipline may be required to take at least three qualifying-year courses before being eligible to enter the master's program.

Students in the qualifying year are encouraged* to select a core theme. They may also wish to select an area emphasis and to take courses that will enable them, in the M.A. year, to engage in specialized study in the problems of a region having particular relevance to the core theme they have elected. Students should also take appropriate courses in order to prepare them to fulfil the language requirements of the M.A. program.

Under current practice, students are expected to achieve a high second-class standing in qualifying-year courses in order to be admitted to the M.A. program.

Program Requirements

Global and Regional Political Economy
The following courses are recommended: Economics 43.360 or 43.361 and 43.362 (half-courses), and Political Science 47.360 and 47.361 (half-courses), or 47.460.

Development Studies
The following courses will normally be required: Economics 43.360 or 43.361 and 43.363 (half-courses), and at least one course in geography, political science, or sociology and anthropology relevant to this theme. Particularly recommended are courses on one of the developing regions: Geography 45.330, 45.331, 45.332 and 45.380 (half-courses); Political Science 47.310, 47.315, or 47.414, 47.415; Anthropology 54.230, and Sociology 53.360.

Conflict Analysis
The following courses are recommended: History 24.380, 24.480 or 24.481; Law 51.463; Political Science 47.361 and 47.365 (half-courses) and 47.270 and 47.460; and Sociology 53.306 and 53.358. Also recommended are courses dealing with other approaches to conflict or with regions in which the student may wish to apply conflict theory.

Master of Arts

Admission Requirements

The minimum requirement for admission into the master's program is an honours bachelor's degree in a discipline related to international affairs. Under current practice, at least a high second-class standing is normally required for consideration for admission to the program.

Students may wish to provide scores on the Graduate Record Examination aptitude test in order to assist the admissions committee.

The Faculty of Graduate Studies and Research requires applicants whose native tongue is not English to be tested for proficiency in English, as described in the application for admission section, page 12 of the general regulations in this calendar.

Candidates who lack the required background in international affairs will be expected to complete a maximum of two additional courses. Core seminar requirements are listed under program requirements for qualifying year.

Students admitted to the international development core are strongly encouraged to take an undergraduate half-course in development economics before beginning the M.A. program in September. Students admitted to the global and regional political economy core are strongly encouraged to take an undergraduate half-course in international economics before beginning their programs in September. Otherwise, these requirements (additional to the M.A.) will have to be taken simultaneously with the M.A. program, and may result in some delay in its completion.

Program Requirements

The normal program requirements for M.A. students in international affairs are:

- One interdisciplinary core seminar or equivalent selected from the following:

International Affairs

46.500 Global and Regional Political Economy
46.505-46.508 Development Studies (two must be selected)
46.515 Conflict Analysis

- Two other approved courses (or the equivalent) in international affairs or related disciplines, if a student elects to write a thesis
- Three other approved courses (or the equivalent) in international affairs or related disciplines, if a student elects to write a research essay
- A thesis (valued at two credits) or a research essay (valued at one credit) involving original research on an approved subject in the field of international affairs
- An ability to read a second major international language, or a language appropriate to a student's major research interest
- An oral comprehensive examination, primarily on the thesis or research essay and core seminar, to determine the candidate's ability to relate various disciplines to the study of international affairs.

English-speaking Canadian students are expected to develop proficiency in French.

Canadian Concentration

Students may elect to include a Canadian concentration as part of their program. This concentration shall include, in addition to one interdisciplinary core seminar or equivalent, the following:

- one of International Affairs 46.511, 46.512, 46.513
- A thesis or a research essay on a Canadian theme.

Candidates who lack the required background in the study of Canada's international policy will be required to complete International Affairs 46.510.

Academic Standing

A grade of B- or better must be obtained in each course credited towards the master's degree. The school does not permit exceptions to this rule.

Career Planning

Students interested in continuing to doctoral programs should plan their programs to include courses in their discipline, if other than international affairs, which may be deemed necessary for their admission to doctoral programs. Interdisciplinary doctoral programs in international affairs are given in a number of institutions and the faculty can provide guidance in planning for these programs.

Recent experiences of students show that a strong background in research methods and economics enhances job placement, and students may wish to take this into account in planning their course program. Part-time students are permitted to enrol in a maximum of two half-courses per term.

School faculty can provide advice on careers in government, international governmental and non-governmental organizations, and in the private sector.

Students preparing for careers in international management should have taken, before their M.A. year, prerequisite courses to include the equivalent of Economics 100, Accounting 100, and statistics. In the school program, a student typically will take a core seminar; international enterprise analysis or international management; two specialized one-term courses with a thematic or regional focus; and a research essay. For international management electives, see graduate offerings in the School of Business, the School of Public Administration, the Department of Economics, and the Faculty of Administrative Studies at the University of Ottawa. See page 15 for reciprocal arrangements with the University of Ottawa.

An increasing number of school graduates find employment in international programs in business and banking. Students planning careers in the private sector should choose their course electives in careful consultation with the school faculty.

Graduate Courses*

Core Seminars

- International Affairs 46.500T2

Global and Regional Political Economy
A study of global political economy, with emphasis on its historical development, regional integration, and contemporary institutional structures.

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

Prerequisite: M.A. standing in the Norman Paterson School of International Affairs or permission of the school.

- International Affairs 46.505F1

International Dimensions in Development Studies
Issues in development financing, international trade, industrialization and technology transfer, food and natural resources, and the role of international organizations.
Prerequisite: M.A. standing in the Norman Paterson School of International Affairs or permission of the school.

- International Affairs 46.506W1

Agriculture and Rural Development
A study of the agricultural sector, rural areas, and rural welfare in developing countries, including consideration of structural change in agriculture, agrarian reform, rural development strategies in various countries, and public policies affecting agriculture, activities ancillary to agriculture, rural industry, and public services.
Prerequisite: M.A. standing in the Norman Paterson School of International Affairs or permission of the school.

- International Affairs 46.507F1

Theories of Development and Underdevelopment
A comparative analysis of approaches to the study of development processes and underdevelopment, including structural-functional, neo-classical, Marxist, and dependency theories.
Prerequisite: M.A. standing in the Norman Paterson School of International Affairs or permission of the school.

- International Affairs 46.508W1

Development Planning: Theory and Practice
Third World development plans and strategies and their impacts; techniques employed in development planning, including social cost-benefit analysis, budgeting, and problems in development administration.
Prerequisite: M.A. standing in the Norman Paterson School of International Affairs or permission of the school.

Students electing development studies as their core seminar will be required to complete two of the above courses numbered 46.505-46.508.

• International Affairs 46.515T2
Conflict Analysis
A study of contemporary theories of international conflict and conflict regulation, negotiations and bargaining.
Prerequisite: M.A. standing in the Norman Paterson School of International Affairs or permission of the school.

Canadian Concentration

• International Affairs 46.510F1
Development of Canada's International Relations
A review of economic, political, and sociocultural factors in Canada's international relations and in the development of its policies.

• International Affairs 46.511W1
Canada in the International Political Economy
Analysis and evaluation of Canada's relationships and policies within the context of the global and regional political economy.
Prerequisite: Enrolment in International Affairs 46.500 or permission of the school.

• International Affairs 46.512W1
Canada and International Development
Analysis and evaluation of Canada's policies and programs with respect to international development.
Prerequisite: Enrolment in two of International Affairs 46.505-46.508, or permission of the school.

• International Affairs 46.513W1
Canada and International Conflict
Analysis and evaluation of Canada with respect to international conflict and conflict resolution.
Prerequisite: Enrolment in International Affairs 46.515 or permission of the school.

Other Courses

• International Affairs 46.520F1
Studies in Strategy and Security
Selected topics in strategic theory and practice.

• International Affairs 46.521W1
Studies in Strategy and Security
Selected topics in strategic theory and practice.

• International Affairs 46.527
Conflict in the Middle East

• International Affairs 46.529
Conflict in Southern Africa

• International Affairs 46.530F1
International Enterprise: Analytical Approaches
The development of concepts and analytical approaches to the study of international enterprises and their impact on international affairs. Literature will be drawn primarily from economics, business, political science, and law.

• International Affairs 46.531W1
International Enterprise: Applied Studies
The application of materials developed in International Affairs 46.530 to a variety of selected policy issues, such as host and home country policies regarding international enterprises, extraterritoriality and the protecting of sovereignty, integration, international unionism, East-West relations, North-South relations, technology transfer, producer cartels, international communications and cultural sovereignty, and international codes of conduct.
Prerequisite: International Affairs 46.530.

• International Affairs 46.532F1
Science, Technology, and International Affairs: Analytical Approaches
The nature of scientific and technological development, and their impact on international relations; conflict between sovereignty and transnational science and technology; assessment of technological impact and scenarios of the future; case studies of international dimensions of technology (communications, armaments, energy resources, LDCs, etc.).
(To be taken by all students who intend to complete 46.533 in the winter term)

• International Affairs 46.533W1
Science, Technology, and International Affairs: Applied Studies
Science, technology, and industry in the context of international relations; multinationals and trade in technology; international problems of environmental quality and resource scarcity; international agencies for science and technology; technology transfer (Western countries; East and West; to LDCs); appropriate technology; science and technology in a coherent development strategy (case studies).
Prerequisite: International Affairs 46.532.

• International Affairs 46.538F1
International Economics: Policy and Theory
An overview of international finance, trade, investment, and international aspects of economic development. Emphasis will be placed on policy analysis and the underlying institutional context.

• International Affairs 46.539W1
International Financial and Monetary Institutions and Policy
A selective, in-depth review of issues such as balance of payments, adjustment processes, and the role of international financial and monetary institutions.

• International Affairs 46.540S1
International Development and International Organizations
A critical examination of the role of the UN and the specialized agencies in the promotion of international development programs.

• International Affairs 46.541
The International Economics and Politics of Resources
An examination of resource-related issues in the international system, focusing on energy, non-fuel mineral, and agricultural areas.

• International Affairs 46.543S1
Future of the International System
Future trends in the international system, emphasizing the impact of science and technology, changes in economic patterns and in communications. Future policy options for Canada in a changing international system.

• International Affairs 46.549F1,W1,S1
Selected Topics in International Affairs

• International Affairs 46.556W1
Advanced International Legal Problems
(Also offered as Law 51.567)

• International Affairs 46.558W1
Advanced Problems of International Economic Law: Legal Aspects of European Integration
In 1983-84, the seminar will focus primarily on the legal aspects of integration in Western Europe, concentrating in particular on the treaty foundations of the European Communities, their institutional framework, the growth of Community law, and the role of the European Court of Justice in integration, selected Community policies, and the position of the Communities in the international economic order.
Prerequisite: A basic course in public international law (for example, Law 51.556) or permission of the school.
(Also offered as Law 51.521)

• International Affairs 46.561
Historical Dimensions of Development and Underdevelopment
Comparative studies in the economic and social history of selected developed and developing countries. The aim is to identify conditions which have fostered or inhibited development in the past, and thereby to assess contemporary development strategies in the light of historical experience.

• International Affairs 46.562W1
Ethical and Cultural Dimensions in Development Studies
Exploration of concepts of value, rights, duties, law, and obligation in relation to global development issues. Comparative analysis of major ideological and ethical foundations of regional cultures, and the problems for cross-cultural and transnational relations.

• International Affairs 46.563
Problems of Development in Africa
(Also offered as Geography 45.520)

• International Affairs 46.564F1
Problems of Development in Latin America

• International Affairs 46.567
Problems of Development in South and South-east Asia

• International Affairs 46.569
Social Cost-Benefit Analysis and Development Project Evaluation
An examination of social cost-benefit analysis and project evaluation in the context of the developing countries, emphasizing applied case studies as well as theoretical analysis.

• International Affairs 46.581W1
Integration in Developing Countries

• International Affairs 46.582W1
The Political Economy of East-West Relations

- International Affairs 46.583W1
Integration in Eastern Europe

- International Affairs 46.588W1
International Political Economy
A seminar on the changing international division of labour and its consequences for world politics. Topics include differing patterns of industrialization, colonial relations, the role of the state, and current issues in international political economy.
Prerequisite: Work at a senior undergraduate level is required in at least two of the following: international relations, development studies, international trade, or political economy (or permission of the school).
(Also offered as Political Science 47.588)

- International Affairs 46.591F1, W1, S1
Tutorials in International Affairs
To be chosen in consultation with the director.

- International Affairs 46.595F1, W1, S1
Research Workshop
This seminar focuses on the special problems of research design in the interdisciplinary field of international affairs, with materials drawn from both the established literature and the practice of leading members of the school's faculty.

- International Affairs 46.598F2, W2, S2
Research Essay

- International Affairs 46.599F4, W4, S4
M.A. Thesis

Selection of Courses

In addition to the graduate courses offered in the school, qualified students may choose from among courses in international affairs offered by related departments, schools, and institutes.

Department of Law

The Department

Chairman of the Department: R.L. Campbell
Director of the Jurisprudence Centre: P.J. Fitzgerald

Although the Department of Law does not offer a program of studies leading to an M.A. degree in Law, it actively participates in such interdisciplinary graduate programs as those offered by the Norman Paterson School of International Affairs, the Institute of Canadian Studies, and the School of Public Administration. Members of the department also supervise graduate theses and research essays, and provide graduate-level tutorials dealing with the legal aspects of various disciplines.

The Jurisprudence Centre, established by the department in 1974, is a forum for the advanced interdisciplinary study of problems related to law, law reform, and policy.

Currently, the Department of Law offers eight courses at the graduate level.

A number of courses offered by the department at the senior undergraduate level form part of certain interdisciplinary graduate programs in such areas as public administration, international affairs, Canadian studies, and Soviet and East European studies. These courses are described in the undergraduate calendar.

Graduate Courses*

• Law 51.510F1
Advanced Problems in Legal Philosophy
Studies in legal theory and analyses of law advanced by Hart, Dworkin, and others; legal concepts: for example, principles, rights, duties, liability, etc. Precise course content will vary from year to year and will be announced at the beginning of the term.

Prerequisites: Either Law 51.315 (32.350), or 51.311 (32.311) and 51.312 (32.312), or permission of the department.
(Also offered as Philosophy 32.510)
P.J. Fitzgerald and R.R.A. Marlin.

• Law 51.521W1
Advanced Problems of International Economic Law: Legal Aspects of European Integration
In 1983-84, the seminar will focus primarily on the legal aspects of integration in Western Europe, concentrating in particular on the treaty foundations of the European Communities, their institutional framework, the growth of Community law and the role of the European Court of Justice in integration, selected Community policies, and the position of the Communities in the international economic order.
Prerequisite: A basic course in public international law, for example Law 51.556, or permission of the department.
(Also offered as International Affairs 46.558)
C.N. Sargent.

• Law 51.550FI
The Canadian Constitution
A highly concentrated half-course, designed to familiarize graduate students with the terminology, principles, and doctrines of judicial interpretation of the *Constitution Acts 1867-1982* and other constitutional statutes. The emphasis will be on the division of legislative powers in the Canadian federation. This course or its equivalent is a prerequisite for the course Law 51.553: Advanced Legal Problems of Federalism.
Prerequisite: Open only to graduate students in their master's year who have not previously studied Canadian constitutional law. Graduate students at the qualifying-year level are advised to consider registering in Law 51.450: Canadian Constitutional Law.
J.G. Neuspiel.

• Law 51.553W1
Advanced Legal Problems of Federalism
An advanced study of selected Canadian constitutional problems including constitutional revision. Some comparisons with other federal systems may be made.

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

Prerequisite: A course in basic Canadian constitutional law, for example Law 51.550, or permission of the department.
J.G. Neuspiel and others.

• Law 51.563F1
International Law
A highly concentrated half-course designed to familiarize graduate students with the terminology, principles, and doctrines of the law of nations. This course or its equivalent is a prerequisite for all international law courses at the 500 level.
Prerequisite: Open only to graduate students in their master's year who have not previously studied international law. Graduate students at the qualifying-year level are advised to consider registering in Law 51.463: Public International Law.
J.G. Neuspiel.

• Law 51.567W1
Advanced International Legal Problems
In 1983-84, this seminar may involve an in-depth analysis of selected international legal problems of particular interest to Canada.
Prerequisite: A basic course in public international law, for example Law 51.556, or permission of the department.
(Also offered as International Affairs 46.556)
J.G. Neuspiel and others.

• Law 51.590T2
Tutorials/Directed Readings in Law
Tutorials or directed readings in selected areas of law, involving presentation of papers as the basis for discussion with the tutor. A substantial requirement for the course may be participation in an advanced law course at the undergraduate level.

• Law 51.591F1,W1,S1
Tutorials/Directed Readings in Law
Tutorials or directed readings in selected areas of law, involving presentation of papers as the basis for discussion with the tutor. A substantial requirement for this course may be participation in an advanced law course at the undergraduate level.

Courses Not Offered in 1983-84

51.556 Advanced Administrative Law Problems

Department of Political Science

The Department

Chairman of the Department:
Harald von Riekhoff
Departmental Supervisor of Graduate Studies:
L.K. Mytelka
Assistant Supervisor: M.B. Dolan

The department offers programs leading to the M.A. and Ph.D. degrees. Specialized graduate study and research may be undertaken in the fields of political theory, Canadian government and politics, comparative government and politics, international relations, and public administration and policy analysis. Within these fields, students may select more specialized areas of concentration, such as classical, medieval and modern, or analytic and empirical theory; comparative government, and politics of a particular area or group of countries, such as Africa, Eastern Europe, or South and East Asia where the department has developed particular strength and resource materials.

Ottawa provides a wealth of resources, both in personnel and in research material, for the student of government, politics, public administration, and international relations. Carleton has specialized schools and institutes in interdisciplinary study in public administration, Canadian studies, international affairs, and Soviet and East European studies. In addition to the University facilities, Ottawa offers the graduate student in political science a host of study and research opportunities unparalleled in Canada. The Public Archives, the National Library, the Library of Parliament, the Supreme Court Library, the National Museums, and Statistics Canada are all located in Ottawa. The headquarters of many government departments, most federal government agencies, and a multitude of national organizations and trade associations are located in Ottawa; many maintain specialized libraries. Some of the embassies and diplomatic missions located in Ottawa maintain specialized libraries, and offer access to documents and other research materials.

Qualifying-Year Program

Applicants who have a general (pass) B.A. in Political Science, with second-class standing, may be considered for admission to a qualifying-year program. Candidates who complete the qualifying year with high second-class standing may be considered for admission to the master's program the following year.

Refer to the general section of this calendar for details of the regulations governing the qualifying year.

Master of Arts

Admission Requirements

The normal requirement for admission to the master's program is an honours B.A. (or the equivalent) in Political Science, with at least high second-class standing.

Honours graduates in fields other than political science will be considered on the basis of their academic background and standing. Those with deficiencies may be required to take additional courses or to register in the qualifying-year program.

Program Requirements

All master's candidates will enrol in an approved number of courses in political science, including political theory and research methodology, if not already taken. No more than one of these courses may be taken at the 400 level.

Each candidate, in consultation with the department, will select and follow one of the following three optional program patterns:

- Five full courses (or the equivalent) in political science
- Four full courses (or the equivalent) in political science, and a research essay on a topic related to one of the courses
- Three full courses (or the equivalent) in political science, and a research thesis, equivalent to two full courses, in an approved field.

All master's candidates in political science must also undertake comprehensive examinations on

approved fields. Details of these examinations are outlined in the section on comprehensive examinations.

All candidates must normally demonstrate a reading knowledge of French. Students from abroad, whose mother tongue is other than English, or students whose research interests require another language, may obtain permission from the departmental graduate studies committee to substitute this language for French. Language tests are conducted twice a year, in October and February.

A supervisor will be assigned to each candidate to advise and assist in the preparation for the comprehensive and language examinations.

Comprehensive Examinations

All master's candidates must successfully pass an oral or a written comprehensive examination in a major field of concentration. Those candidates following the five-course or four-course (plus research essay) program pattern will also be required to relate theory and research in that field of political science to an allied field in political science or, with the permission of the departmental graduate studies committee, a discipline related to political science. Those candidates selecting the three-course (plus thesis) program pattern will be required to present an oral defence of the thesis in lieu of an allied field examination. The major field of concentration will be chosen from the following:

- Political Theory
- Canadian Government and Politics
- Comparative Government and Politics
- International Relations
- Public Administration and Policy Analysis

To prepare for the comprehensive examination, the student will pursue an approved program of courses related to his/her chosen field. Comprehensive examinations normally will be undertaken no later than the term immediately following completion of the course work for the master's degree.

Academic Standing

All master's candidates must obtain at least B standing (grade point average of 8.0). One grade of C+ may be allowed.

Doctor of Philosophy

The Ph.D. program in political science normally will be undertaken on a full-time basis. However, in cases of exceptional merit, the department will accept a few candidates for the degree on a part-time basis.

Admission Requirements

The normal requirement for admission to the Ph.D. program is a master's degree (or its equivalent) in political science, public administration, or international affairs, with at least high second-class standing. This normally will mean a Carleton equivalent grade point average of 9.5, taking into account both transcript and letters of reference.

Program Requirements

The normal program requirements for Ph.D. candidates are outlined in the general regulations section of this calendar.

All students are required to have or to acquire an adequate basic knowledge of political theory and research methodology, regardless of their field of specialization. They will also be expected to undertake further work in statistics, if statistical proficiency is needed for the preparation of the thesis.

The specific program requirements for Ph.D. candidates in political science are the following:

- At least three graduate full courses (or the equivalent); a grade point average of at least 9.0 must be obtained in these courses before proceeding to the comprehensive examinations. Additional courses may be required for candidates whose background or standing is deficient. Students are encouraged to take additional courses for credit or audit, beyond the minimum requirement of three, in order to prepare for comprehensive examinations in areas of specialization in each of their fields.
- Program options for Ph.D. field selections: *either* two major fields with two subfields in each, *or* a major field with two subfields and two minor fields with a subfield in each; that is, a choice of one of two program options: Political Science 47.690 and 47.695, *or* Political Science 47.690, 47.691, and 47.692.

- Proficiency in languages and/or research skills, as outlined below under language and research skill requirement
- Comprehensive examinations, as outlined below under comprehensive examinations
- A thesis, written in English or French, which must be defended in English at an oral examination; this examination may include material related to the general field of the thesis.

The completion of the Ph.D. program will normally require at least two years of full-time study beyond the master's degree.

A supervisor and at least two other advisers will be assigned to each Ph.D. candidate to advise him/her on his/her studies. The student's entire program must be approved by the department.

Language and Research Skill Requirement

All Ph.D. candidates must demonstrate an ability to use two research skills appropriate to their program, one of which must be a language other than English.

Candidates, one of whose fields is Canadian government and politics, or whose thesis deals mainly with Canada, must demonstrate an ability to read and translate French easily as one of their skill requirements.

All other candidates must demonstrate an ability to read and translate easily a language appropriate to their program.

The second skill requirement may be fulfilled in one of the following ways:

- A demonstrated ability to read and translate easily a second language
- An oral knowledge of a language sufficient to conduct interviews in the language
- Satisfactory completion (B- or better) of *two* of Political Science 47.571: Research Design; Political Science 47.572: Applied Research Methods; Political Science 47.573: Advanced Research Methods.
- Credit work in an approved political science methodology workshop or colloquium.

The research skill requirement shall *normally* be satisfied before the thesis proposal defence.

Comprehensive Examinations

All Ph.D. candidates must select one of the two options below:

- A written examination in two major fields covering general knowledge of the field; examination in two approved areas of specialization in each field, the form of examination to be determined by the supervisory committee in conjunction with the supervisor of graduate studies.
- A written examination in one major field covering general knowledge of the field, and examinations in two approved areas of specialization; a written general examination in two minor fields, and examination in one approved area of specialization in each. The form of examination in areas of specialization will be determined by the supervisory committee in conjunction with the supervisor of graduate studies.

In addition, candidates must undertake a final oral comprehensive examination integrating the fields.

The comprehensive examinations will normally be completed by the beginning of the seventh term of registration. Candidates will be expected to complete these examinations successfully before beginning the thesis. The fields of study for the Ph.D. examinations are to be chosen from the following list:

Political Theory

A general knowledge of the main outlines and significant themes and problems of political philosophy and thought, with emphasis on two of the following: classical (mainly Greek and Roman); modern (Machiavelli through the nineteenth century); contemporary (twentieth century); Canadian and American political thought and its immediate European background; current theories and approaches to political analysis; methodology and theory construction.

Canadian Government and Politics

A general knowledge of Canadian political ideas, institutions, and processes, with emphasis on two of the following: federalism and the constitution; parliament and legislatures; parties, elections, and interest groups; political culture and socialization; political economy; provincial and local government and politics; public administration and policy analysis (if not chosen as a sub-field under public administration and policy analysis);

Canadian political thought and ideology (if not chosen as a sub-field under political theory).

Comparative Government and Politics
A general knowledge of the theories and methodology of comparative politics, with emphasis on one sub-field from each of the following two lists:
- Countries or areas: Western Europe; USSR and/or Eastern Europe; United States; Africa; or an approved combination of countries or areas.
- Topics or themes: political development and integration; political stability and change; federalism; legislatures; local government and politics; multiculturalism and the politics of ethnicity; political parties and interest groups; public opinion and voting behaviour; policy analysis.

International Relations
A general knowledge of international theory, international organization, and the development of the field of international relations, with specialization in two of the following: analytical international theory; comparative analysis of foreign policy (including a knowledge of a particular state or region); international integration and organization; conflict analysis; international political economy.

Public Administration and Policy Analysis
A general knowledge of theory and of practice in Canada, Britain, and the United States, with emphasis on two of the following topics: theories of administration, organization, comparison, and policy analysis; Canadian public administration and policy analysis (including some knowledge of provincial and municipal levels); comparative public administration (with reference to either developing or developed countries, or an approved combination of countries); administrative responsibility (including judicial controls).

Selection of Courses

Within the scope of the regulations, the following undergraduate courses (fully described in the *Carleton University Undergraduate Calendar*) may be taken by graduate students.

Please note that all of these courses are not offered every year. Students should consult the timetable published each year in early June.

Political Science
47.400 Topics in Canadian Government and Politics
47.401 Policy Making in Canada
47.402 Policy Seminar: Problems of Northern Development
47.403 Politics and the Media
47.404 Interest Groups in Canadian Politics
47.405 Federalism
47.406 Legislative Process in Canada
47.407 The Politics of Law Enforcement in Canada
47.408 National Security and Intelligence in the Modern State
47.409 French-Canadian Politics
47.412 Society and Politics in Liberal Democracies
47.413 The State in Advanced Capitalist Societies
47.414 Theory and Practice in Third World Development
47.415 Selected Problems in Third World Development
47.420 Policy Making in the United States
47.421 Politics of Influence in the United States
47.422 Constitutional Politics
47.430 Concepts of the State
47.431 Marxist Thought
47.432 Contemporary Marxism
47.435 Contemporary Political Theory
47.446 Theories of Public Administration
47.447 Decision Theories and Policy Studies
47.448 Public Organizations: Theory and Practice
47.460 Analysis of International Relations
47.461 Soviet Foreign Policy
47.466 American Foreign Policy
47.467 International Politics of North America
47.470 Political Research Design and Data Analysis
47.482 International Politics of Africa
47.483 Foreign Policies of Major East Asian Powers

Students are encouraged to look at the course offerings of the Departments of Sociology and Anthropology, and Economics; the Schools of International Affairs, Journalism, Public Administration, and Social Work; and related disciplines at Carleton.

Except where an M.A. student is permitted to take an allied field in another discipline, a graduate student will normally take no more than one

course in another department, school, or institute, in fulfilment of the M.A. or Ph.D. requirements.

Graduate Courses*

The following is a complete list of all political science graduate-level courses. Students should consult the timetable (published in early June) for a list of courses which will be offered during 1983-84.

- Political Science 47.501F1 or W1
Canadian Provincial Government and Politics
A research seminar on selected problems.
Prerequisite: Political Science 47.200 or permission of the department.

- Political Science 47.503F1 or W1
Political Parties in Canada
A seminar on political parties and party systems in Canadian federal politics, including an examination of patterns of historical development, party organization and finance, relationships with social movements, and the impact of Canadian federalism.

- Political Science 47.505T2
Comparative Government
A research seminar dealing in the fall term with theories, methods, and problems of comparison, and in the winter term with particular themes.

- Political Science 47.506F1 or W1
Problems of Canadian Government and Politics I
A research seminar on selected problems.

- Political Science 47.507F1 or W1
Problems of Canadian Government and Politics II
A research seminar on selected problems.

- Political Science 47.508F1 or W1
The Politics of Energy and the Environment
A research seminar focusing upon the substantive issues, the policy structures and processes, and current Canadian governmental response in the area of energy policy and environmental quality management.

- Political Science 47.509F1 or W1
Canadian Political Economy
A seminar on political economy as a traditional and contemporary approach to the study of Canadian politics. The theoretical bases of this approach will be discussed, as will the controversies generated in its examination of the relationship between the Canadian state and international and domestic capitalism. Specific topics will range from the staple thesis and the national policy, to the hinterland perspective on Western Canada, and to the contemporary literature on dependency, class, and state.

- Political Science 47.510T2
The Political Process in Canada
An analytical study of the democratic political process, with particular reference to political parties and elections, pressure groups, and political leadership in Canada.

- Political Science 47.511F1 or W1
Canadian Federalism
A study of the evolution and contemporary operation of the Canadian federal system, noting particularly the specific social, political, economic, and structural features which underlie its operational performance, its resilience in crisis, and its potential for adaptation.

- Political Science 47.514F1 or W1
Comparative Communist Politics: Theory and Practice
Examination and analysis of basic models of communist political systems, with emphasis on problems of systemic change and adaptation (inclusive of Soviet, East European and Asian systems, and Cuba).
Prerequisites: Political Science 47.320 and 47.215 or 47.312, or permission of the department.

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

• Political Science 47.515F1 or W1
Comparative Communist Politics: Selected Aspects
Examination and analysis of selected aspects of communist political processes, such as integration, elite formation, leadership and succession, and decision making. The emphasis will change from year to year.
Prerequisite: Political Science 47.514 or permission of the department.

• Political Science 47.516F1 or W1
Selected Problems in Soviet Politics
A seminar on selected aspects of the Soviet political system, with special attention to the interrelationship among politics, culture, and society in the USSR.
Prerequisites: Political Science 47.100, 47.320 and 47.432, or permission of the department.

• Political Science 47.517F1 or W1
Selected Problems in African Politics
A political economy approach will be taken in this seminar, stressing the relationship of dependence, underdevelopment, participation, and class formation to the decision-making process in selected countries.

• Political Science 47.518F1 or W1
State, Revolution, and Reform in East Asia
Problems of state-building, political institutions, and policy making in the sinitic world, including the People's Republic of China, Taiwan, Japan, North and South Korea, Singapore, and Vietnam.
Prerequisite: Political Science 47.312 or permission of the department.

• Political Science 47.520F1 or W1
Nationalism
A seminar on the historical and comparative study of nationalism, with emphasis on its role in the promotion of political change.

• Political Science 47.521F1 or W1
Politics in Plural Societies
A seminar on politics in multicultural societies, with emphasis on Canada and other developed democracies. Topics will include structural segmentation, consociational processes, intergroup attitudes, and institutional adjustments to pluralism.

• Political Science 47.525F1 or W1
Problems in American Government I
A research seminar on topics such as the distribution of power, decision-making processes, the impact of technology, strains in intergovernmental relations, civil-military relations, governmental news management and secrecy; executive accountability, and impediments to reform of Congress and the presidency.

• Political Science 47.526F1 or W1
Problems in American Government II
A research seminar on topics such as political violence and social change, the roles of mass media, business elite roles, political corruption, civil rights and minority politics, and the urban crisis.

• Political Science 47.530T2
Political Theory
An intensive examination of the major questions in classical, medieval, modern, and contemporary political philosophy. This political theory course is both historically comprehensive in scope and thematically oriented in depth. There is a coordinator for the course, but as various topics are dealt with, others who possess expertise in the specific area conduct the seminars.

• Political Science 47.532F1 or W1
Democratic Theories
Analysis of various democratic theories, from classical to modern, including a contemporary democratic theory of labour-managed systems applicable to welfare, liberal, and socialist states.

• Political Science 47.533F1 or W1
Inquiries in Political Philosophy
A seminar dealing with topics such as critical theory, obligation and disobedience, historicism and nihilism, and the critique of modernity.

• Political Science 47.534F1 or W1
Analytical Political Theory
The role of theory in the study of politics, and the major concepts used in political analysis. The possibilities and limitations of the historical, institutional, positivist, functional, and behavioural approaches will be emphasized.

• Political Science 47.535T2
The Canadian and American Political Traditions
A seminar on the interpretation of the American,

English-Canadian, and French-Canadian political traditions, with emphasis on their comparative development.

- Political Science 47.540T2
Canadian Public Administration and Policy Analysis
This course is intended to offer to the student the opportunity for an intensive examination of policy processes and institutions in Canada, as well as more general theory and practice of public administration in this country.

- Political Science 47.544F1 or W1
Public Administration in Developed Western Countries
A seminar in comparative public administration, with emphasis on Commonwealth countries, the U.S., France, and West Germany.

- Political Science 47.545F1 or W1
Public Administration in Developing Countries
A seminar on the literature and characteristics of development administration; comparison by region, country, and topic.

- Political Science 47.546F1 or W1
Theories of Public Administration
A seminar on theories of bureaucracy, organization, and comparison.

- Political Science 47.547F1 or W1
Decision Theories and Policy Studies
This course will cover decision making and policy studies in a non-mathematical way from two complementary angles: basic philosophy, psychology, and theory of individual and group decision making; and overall policy analysis as pursued by Vickers, Dror, and others, with a brief look at tools of decision making.

- Political Science 47.548F1 or W1
Research Seminar in Public Administration I
The content of this seminar will vary from year to year according to faculty research interests and student demand.

- Political Science 47.550T2
Problems in Western European Politics
This course will deal intensively with politics in Britain, France, Germany, Italy, and selected minor European powers both democratic and authoritarian.

- Political Science 47.560T2
Theory and Research in International Politics
An examination of the principal problems in contemporary international relations theory and research, emphasizing the state of the field and current directions in it.
Prerequisite: Political Science 47.460 or permission of the department.

- Political Science 47.561F1 or W1
Analysis of Canadian Foreign Policy
A research seminar on contemporary Canadian external policies, with emphasis on the analysis of cases and issues, and comparisons with other national actors.
Prerequisites: Political Science 47.260 and 47.366, or permission of the department.

- Political Science 47.570F1 or W1
Basic Research Methods
A half-course for graduate students with no background in research methods. Content: basic statistics and applications.

- Political Science 47.571F1 or W1
Research Design
A seminar in research design, including data collection and data analysis. This course will teach students to construct research designs with two foci: the traditional academic investigation of theoretical problems, and the emerging field of public policy analysis and evaluation research.
Prerequisite: Political Science 47.570 or permission of the department.

- Political Science 47.572F1 or W1
Applied Research Methods
A half-course on problems of applying research methods to substantive problems. Topics will include adjusting designs to account for changed conditions in the field; overcoming barriers to data collection; and interpreting the results of data analysis. The course will proceed by examining completed research projects in various sub-fields, and applying the conclusions reached to students' research plans. Intended for students planning to engage in research in the immediate future.
Prerequisite: Political Science 47.570 or permission of the department.

• Political Science 47.573F1 or W1
Advanced Research Methods
A half-course in advanced techniques of analysis. The focus of this research seminar is the use of various mathematical and statistical techniques in the construction and analysis of political theory. The seminar may include such topics as the translation of verbal theory into formal theory, the use of statistical techniques beyond regression and correlational analysis to examine political hypotheses, and index construction, including scaling and validation techniques.
Prerequisite: Political Science 47.570 or permission of the department.

• Political Science 47.581F1 or W1
Foreign Policies of African States
The foreign policy determinants and international behaviour of African states. Each year, the seminar will focus on a particular issue area.

• Political Science 47.585F1 or W1
Foreign Policy Analysis
A research seminar dealing with selected problems in the study of foreign policy formulations and outcomes.
Prerequisite: Political Science 47.460 or permission of the department.

• Political Science 47.586F1 or W1
Strategy
A research seminar on the analysis of recent western as well as Soviet and Chinese strategic concepts, civilian-military relations, defence policy, decision making, and arms control and disarmament.

• Political Science 47.588F1 or W1
International Political Economy
A seminar on the changing international division of labour, and its consequences for world politics. Topics include differing patterns of industrialization, colonial relations, the role of the state, and current issues in international political economy.
Prerequisite: Work at a senior undergraduate level is required in at least two of the following: international relations, development studies, international trade, or political economy (or permission of the department).
(Also offered as International Affairs 46.588)

• Political Science 47.589F1 or W1
Problems in International Politics
A workshop on significant issues in the study of international politics, with emphasis on the state of the field (and sub-fields) and problems in research.
Prerequisite: Political Science 47.560 or permission of the department.

• Political Science 47.590T2
Tutorial in a Selected Field
Tutorials or reading courses on selected topics may be arranged with the permission of the department.

• Political Science 47.591F1, W1, S1
Tutorial in a Selected Field
Tutorials or reading courses on selected topics may be arranged with the permission of the department.

• Political Science 47.594F1, W1, S1
M.A. Comprehensive Tutorial
Tutorial designed as preparation for the M.A. comprehensive examination, under the direction of members of the department. The grade to be awarded will be that obtained on the comprehensive examination.

• Political Science 47.598F2, W2, S2
M.A. Research Essay
Tutorial for students who write a research essay rather than a thesis.

• Political Science 47.599F4, W4, S4
M.A. Thesis

• Political Science 47.690F3, W3, S3
Ph.D. Tutorials
Ph.D. tutorials specifically designed as intensive preparation for the major field examinations, under the direction of one or more members of the department. The grade to be awarded will be that obtained on the field examination.

• Political Science 47.691F3, W3, S3
Ph.D. Tutorials
Ph.D. tutorials specifically designed as intensive preparation for the minor field examinations, under the direction of one or more members of the department. The grade to be awarded will be that obtained on the field examinations.

- Political Science 47.692F3, W3, S3
Ph.D. Tutorials
Ph.D. tutorials specifically designed as intensive preparation for the minor field examinations, under the direction of one or more members of the department. The grade to be awarded will be that obtained on the field examinations.

- Political Science 47.695F3, W3, S3
Ph.D. Tutorials
Ph.D. tutorials specifically designed as intensive preparation for the major field examinations, under the direction of one or more members of the department. The grade to be awarded will be that obtained on the field examination.

- Political Science 47.699F10, W10, S10
Ph.D. Thesis
Ph.D. students in political science at Carleton University may also seek supervision from the faculty of related schools and departments, particularly the School of Public Administration, the Norman Paterson School of International Affairs, the School of Journalism, and the Departments of Economics and Sociology and Anthropology.

Courses Not Offered in 1983-84

47.500 Canadian Local Government and Politics
47.502 Comparative Local Government
47.531 Modern Political Culture and Ideology
47.549 Research Seminar in Public Administration
47.587 Analysis of International Organization

The Department

Chairman of the Department: W.G. Webster
Departmental Supervisor of Graduate Studies: R.F. Hoffmann

The Department of Psychology offers programs of study and research on a full-time and part-time basis, leading to the degrees of Master of Arts and Doctor of Philosophy. Financial support is available, but is limited to full-time students.

There is a very close link in the Department of Psychology between graduate studies and research. Research in the department is distributed across the life sciences areas of biopsychology, animal learning, perception, and cognition, and across the social sciences areas of social and developmental psychology. Its research and graduate program in biopsychology is one of the strongest in Canada, with current research focusing on problems of the neurochemistry of stress and learning; developmental psychopharmacology; experimental models of epilepsy; neuroanatomy; brain lateralization; neural mechanisms of audition; drug dependence; and the effects in animals and humans of prenatal alcohol and drug exposure on postnatal behaviour. The department has related and unique human neuropsychological research activities dealing with alterations to visual and auditory psychophysical functions associated with neuropathological conditions; determinants, correlates, and treatment of hyperactivity in children; and the relation of behavioural, psychological, and electrophysiological variables to sleep and dreaming states. Within the social sciences realm, a unique laboratory has been developed for the study of hypnosis, approached experimentally from social psychological, perceptual, and cognitive perspectives provided, in part, by other on-going research programs in the department. In recent years, there has been a growth of activity in aspects of applied psychology, including evaluation research; corrections; education; impact of computer and telecommunications technology; behavioural medicine; and psychological assessment. This has fostered close collaborative contacts between the department and public service and applied settings in Ottawa, such as the Children's Hospital of Eastern Ontario, the Royal Ottawa Hospital, the National Research Council, Department of Communications (Canada), Ontario Ministry of Correctional Services, and the Ottawa Board of Education. Practica and internships are available in many of these settings to students at the doctoral level.

Because of the breadth of interests in the department, there is an emphasis in graduate courses on methodological and conceptual issues that are applicable across specific research specializations. Consequently, most substantive courses, regardless of title, are relevant to most students' programs. Students typically work very closely with their advisers who, through informal tutorials and directed studies and independent research courses, provide much of the opportunity for specialized study. Applicants are strongly encouraged to write directly to faculty members for more specific details on research interests and programs currently underway.

As part of its general experimental program, the department provides the opportunity to pursue a concentration at the doctoral level in behavioural neuroscience (a collaborative endeavour with the University of Ottawa), human neuropsychology, or human information systems. Applicants should consult with the supervisor of graduate studies for information on structuring a doctoral program of studies within a concentration.

Through a quantitative methods requirement, completion of a demanding empirical thesis presented and defended orally, participation in small seminars, and a close relationship with faculty advisers and students, the M.A. program provides the opportunity for a refinement of critical, logical, and analytical skills; skills of written and oral expression; understanding of the strengths and limitations of the scientific method as a means of problem solving, demonstrated through psychology but applicable to issues in society at large; and understanding of quantification and scaling, the use of

statistical methods and inference, and the use of evidence to support argument. For some students this is a satisfactory and satisfying end in itself. For others, it provides a solid preparation for the doctoral program in which original independent study and research is stressed. The department does not distinguish between an applied and an experimental program; instead, the basic orientation is experimental and theoretical, but with opportunities, where appropriate, to provide complementary experience necessary to work successfully as a psychologist in applied research/service settings.

Augmenting the well-equipped laboratories expected in an active research environment, the Department of Psychology receives excellent technical support from the Carleton University Science Workshops, where design and manufacture of special-purpose apparatus is carried out. In addition, the workshops provide technical support for the more than 25 computer systems currently in use in laboratories throughout the department.

Graduate students have access to the Xerox Sigma 9 and Honeywell Level 66 computer systems, supported by the Computing Services division of the University. These systems support a variety of computer languages, including FORTRAN, APL, PASCAL, and BASIC, several microcomputer emulatory programs, a variety of statistical and mathematical packages, such as the BMDP and SPSS systems, and many other programs.

In fulfilling degree credit requirements, all graduate students are required to demonstrate competence in statistical and quantitative methods through successful completion of Psychology 49.545 (with a grade of B– or better) or a qualifying examination. This is ordinarily scheduled during the first part of September, just prior to the registration period, and it encompasses the material covered in Psychology 49.545. In the event of successful completion of the examination, another course is substituted for Psychology 49.545. In the case of M.A. students, the department may recommend that a grade of C or C+ in Psychology 49.545 be accepted for credit (see page 18 of the general regulations) only after successful completion of the qualifying examination. This option is limited to those who pass the examination within two successive offerings of it, and who maintain continuous registration as graduate students between the first registration in Psychology 49.545 and the taking of the examination.

In addition to fulfilling the remaining credit requirements as described in subsequent sections, all graduate students in psychology are expected to conduct research of interest to them during each year of graduate study. This requirement may be satisfied by independent research, serving as a research assistant, or by doing pilot or thesis research.

Each year, the candidate's adviser submits a written critique of research progress, and this becomes part of the candidate's permanent record. Qualifying-year students are evaluated at the end of the first 12 months. In addition to research activity, candidates may be required to serve as teaching assistants.

Depending on his/her field of concentration, a candidate may be required to demonstrate an ability to read with understanding relevant technical material in a foreign language and/or to give satisfactory evidence of competence in such areas as computer techniques, electronic instrumentation, psychometrics, sampling procedures, or surgical techniques.

The department may recommend that a graduate student be asked to withdraw from the program at any time if his or her progress in course work, research, or comprehensive examinations proves unsatisfactory.

Ottawa-Carleton Graduate Specialization in Neuroscience

The Departments of Biology and Psychology at Carleton University, and the Departments of Anatomy, Physiology, and Psychology at the University of Ottawa provide a graduate specialization in neuroscience at the Ph.D. level (and, under special circumstances, at the M.Sc. or M.A. level). Further details may be obtained from any of the above member departments.

Qualifying-Year Program

Occasionally, candidates with exceptional promise who offer less than honours B.A. status may be admitted to a qualifying-year program, approved by the graduate studies committee, and designed to prepare them for master's study. A minimum grade of B- must be obtained in each qualifying-year course, and candidates may be required to complete satisfactorily the equivalent of an honours B.A. thesis.

Master of Arts

Admission Requirements

The normal requirement for admission into the master's program is an Ontario honours B.A. (or its equivalent) with high second-class standing and with credit in the following areas: statistics and design of experiments; experimental psychology; learning or motivation; physiology and/or comparative psychology; and history and/or systems.

Candidates with particular course deficiencies may be required to register in additional courses at Carleton.

Scores on the Graduate Record Examination are required at the time of application.

Program Requirements

The master's program usually consists of three full courses (or the equivalent), of which at least two must be at the graduate level (numbered 500 or higher), and a thesis (equivalent to two full courses) which must be defended at an oral examination. Psychology 49.545, its equivalent, or the successful completion of the opting-out examination in quantitative methods, is required of all graduate students. In the latter instance, another course is substituted for 49.545.

Academic Standing

A grade of B- or better is normally required in each of the courses counted for credit towards the M.A. degree. The department is prepared on occasion to recommend to the dean that a candidate be allowed a grade of C+ or C (but not C-) in one full course or each of two half-courses. In the case of Psychology 49.545, such a recommendation will be based on successful completion of the qualifying examination. This option is limited to those who pass the examination within two successive offerings of it, and who maintain continuous registration as graduate students between the first registration in Psychology 49.545 and the taking of the examination.

Doctor of Philosophy

Admission Requirements

The requirements for admission to Ph.D. programs are outlined in the general section of this calendar. Scores on the Graduate Record Examination are also required at the time of application.

The Ph.D. program in psychology normally will be undertaken on a full-time basis; however, in cases of exceptional merit, the department will accept a few candidates for the degree on a part-time basis. A Ph.D. candidate who enters the part-time program will normally be required to be registered as a full-time student for a minimum of three terms, at least two of which are consecutive. The time limit for completion of Ph.D. degree requirements for those who enter the program on a part-time basis will be the same as for those who enter on a full-time basis and subsequently register for part-time study: that is, eight calendar years. (see Time Limits, page 20)

Applicants should note that of the B.A., M.A., and Ph.D. degrees in Psychology, only two may ordinarily be taken at Carleton University.

Program Requirements

The minimum program requirements for the Ph.D. degree in Psychology are as follows:

- 10 full-course credits, with a minimum grade of B- in each course
- Psychology 49.545, its equivalent, or the successful completion of the opting-out examination in quantitative methods, is required of all graduate students. In the latter instance, another course is substituted for 49.545.
- A thesis equivalent to four of the required 10 full-course credits will be required for concentration in the history of psychology. Ordinarily, in the

other areas of psychology, the thesis will be offered in fulfilment of five of the required 10 credits.

- A major area of specialization must be selected in which not less than six nor more than 7½ full-course credits (including the thesis) may be offered in fulfilment of the 10-course requirement.

Comprehensive Examinations

All Ph.D. candidates are required to pass written and oral examinations in their area of specialization. There are two optional forms for the written comprehensive examination: two major essays, or one major essay and one research grant proposal. The submission of each essay or grant proposal will be followed within one to three weeks by a comprehensive oral examination, which is not restricted to issues raised by the written portion.

Ordinarily, the comprehensive examinations must be completed successfully before the Ph.D. prospectus meeting is scheduled. One oral defense must occur within four calendar terms of the student's initial registration in the Ph.D. program; the second must be defended within six calendar terms of initial registration.

Graduate Courses*

- Psychology 49.510F1
Research Methods in Social Psychology I
Experience with research and data analysis techniques of particular relevance for social psychology, such as sampling, attitude scaling, and measurement. Normally required of students writing a thesis in social psychology.

- Psychology 49.511W1
Research Methods in Social Psychology II
Current ethical and methodological issues in social psychological research, such as experimental effects, deception, and subject variables. Normally required of students writing a thesis in social psychology.

- Psychology 49.515
Fundamentals of Computing for Psychologists
A survey of computer and communication hardware and software. The purpose of the course is to make psychologists aware of the concepts and terminology used by engineers and programmers in planning computer applications; it is not designed to train students to be programmers or to build equipment. The course will have a weekly laboratory.
Prerequisite: One course in computer programming.

- Psychology 49.516
Applications of Computers to Thinking, Problem Solving, and Decision Making
A survey of literature in such fields as artificial intelligence, database management, computer-aided instruction, simulation and forecasting, and computer-mediated communication. Psychological principles in the design, use, and evaluation of these cognitive aids will be stressed.
Prerequisite: Psychology 49.515.

- Psychology 49.520T2
Neuroscience
An evaluation of current methodologies, concepts, and knowledge in brain science. The emphasis will be upon behavioural neuroscience and neuropsychology. Lectures to be presented by neuroscientists from Carleton University and the University of Ottawa.

- Psychology 49.530W1
Perceptual Processes
Theoretical and empirical issues and implications of the area of perception, with attention to psychophysics, information processing, physiological mechanisms, and the ontogeny of perception.

- Psychology 49.545T2
Quantitative Psychology
The application of selected statistical techniques in psychology, including basic hypothesis testing, analysis of variance, multiple linear regression, nonparametric techniques, and multivariate analyses. Extensive use is made of computer statistical packages.

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

• Psychology 49.546F1
Advanced Methodology
An in-depth exposure to various methodological and statistical problems related to students' chosen areas of specialization; to examine in detail and gain experience with various statistical programs, such as SPSS.
Prerequisite: Computing Science 95.101.

• Psychology 49.547F1
Tests and Measurements
The administration and use of representative psychological tests.
Prerequisite: Psychology 49.330.

• Psychology 49.551F1
Developmental Psychology I
A detailed examination of selected issues in developmental psychology.

• Psychology 49.552W1
Developmental Psychology II
A continuation of 49.551.

• Psychology 49.561W1
Contemporary Research in Personality
Current controversial issues in personality research, and selected theoretical and research studies in personality.

• Psychology 49.570F1
Research Methods in Learning
Methods, research design, and instrumentation in the fields of learning and retention, with emphasis on response definition and measurement, procedures for monitoring the learning process, and problems of control.

• Psychology 49.573W1
Human Learning
A discussion of selected topics within the area of human learning.

• Psychology 49.575F1
Behaviour Modification I
The basic principles of learning as they apply to the modification of behaviour, with emphasis on application, ethics, research, and methodology.

• Psychology 49.576W1
Behaviour Modification II
Special problems, topics, and projects related to behaviour modification.
Prerequisite: Psychology 49.575.

• Psychology 49.580F1, W1, S1
Special Topics in Psychology
The topics of this course will vary from year to year, and will be announced in advance of the registration period.

• Psychology 49.590F1, W1, S1
Directed Studies
An investigation in depth of selected problems in psychology by means of directed library research. Registration is restricted, permission to register being granted only by the graduate committee. A final report must be filed in the departmental office prior to submission of course grade.

• Psychology 49.591F1, W1, S1
Independent Research
Permission to register and approval of research plan must be obtained from the graduate committee. A final research report must be filed in the departmental office prior to submission of course grade. The course may be repeated for credit.

• Psychology 49.599F4, W4, S4
M.A. Thesis

• Psychology 49.600F1
Systems of Psychology
Historical research methods on the study of psychological movements and problems of the late nineteenth and early twentieth centuries; may be repeated for credit.
(Open with permission to advanced undergraduates)

• Psychology 49.601W1
Problems in the History of Psychology
A study of one or more selected topics in the history of man's attempt to understand his own nature; may be repeated for credit.
(Open with permission to advanced undergraduates)

• Psychology 49.603
Observation, Description, and Explanation in Psychology
Problems of communication, concept formation, and exploration in the biosocial sciences are discussed. The interplay of facts, methods, models, theories, and the human values which these serve are also explored.

• Psychology 49.610F1
Research Seminar in Social Psychology I

• Psychology 49.611W1
Research Seminar in Social Psychology II

• Psychology 49.612F1
Experimental Hypnosis
Selected issues in the study of experimental hypnosis will be critically reviewed. The problem of hypnotic susceptibility and its correlates will be given particular attention. Relationships among hypnotic phenomena, meditation, and behaviour therapy will be evaluated.

• Psychology 49.615
Psychological Aspects of Computer Use
An investigation of human factors related to the effective design of computer hardware and software. Topics may include the design and evaluation of information search procedures, graphic displays, and operation manuals on the assessment of useability. A research project will be required.

• Psychology 49.616
Social Aspects of Computer Use
An investigation of the social psychological and political factors affecting the adoption and use of computers. Topics may include the design and evaluation of training programs, the assessment of attitudes towards computers, threats to privacy and jobs, and computer crime. Emphasis will be placed upon the organizational and interpersonal changes resulting from the introduction of computers into work settings. A research project will be required.

• Psychology 49.620F1
Research Seminar in Physiological Psychology I

• Psychology 49.621W1
Research Seminar in Physiological Psychology II

• Psychology 49.626F1
Comparative Psychology
Varied and acquired adaptive mechanisms and their phylogenesis. Topics will include attachment behaviour, social organization, learning abilities, communication, and motivation.

• Psychology 49.650F1
Research Seminar in Developmental Psychology I

• Psychology 49.651W1
Research Seminar in Developmental Psychology II

• Psychology 49.661F1
Seminar in Human Neuropsychology I
A broad and intensive consideration of selected topics in human neuropsychology, integrating findings from psychology with related medical literature.

• Psychology 49.662W1
Neuropsychological Assessment
Review of the rationale and practice of diagnosis and treatment based on neuropsychological test results. The reliability and validity of test batteries such as the Halstead-Reitan and the Luria-Nebraska are studied. A variety of methods of test interpretation are utilized in clinical analysis of patient protocols, including degenerative diseases, psychiatric disorders, seizures, head injury, and brain tumors.
Prerequisite: Psychology 49.661.

• Psychology 49.663F1
Seminar in Human Neuropsychology III
(Same description as 49.661)

• Psychology 49.664W1
Theories of Brain Dysfunction in Psychopathology
A review of neuropsychological theoretical explanations and empirical findings regarding brain functioning in a variety of organic and psychiatric disorders, such as autism, schizophrenia, minimal brain dysfunction, anorexia nervosa, aphasia, and memory disorders. These disorders are examined from neurological, psychological, biochemical, and neuropsychological points of view.
Prerequisite: Psychology 49.661.

• Psychology 49.665F1
Comparative Neuropsychology
An examination, from a comparative perspective, of research and logic associated with the study of brain-behaviour relations. The objective of the course is to provide a background and orientation for evaluating infra-human research of brain-behaviour relations, and for relating such research to problems of human neuropsychology.
W.G.Webster.

• Psychology 49.666W1
Human Communication Disorders
The course provides an overview of normal and abnormal functions of the auditory system, particularly as it relates to the perception of human

speech sounds. Diagnosis of clinical syndromes will be covered.

• Psychology 49.667W1
Developmental Psychopharmacology
The synthesis and metabolism of various neurotransmitters are detailed with respect to their role in behaviour modulation. The ontogeny of these systems is considered, as are behavioural changes which occur as a consequence of aberrant neurochemical activity.
(Open with permission to advanced undergraduates)

• Psychology 49.670F1, W1
Research Seminar in Learning

• Psychology 49.680F1, W1
Special Topics in Psychology
(Same description as 49.580)

• Psychology 49.690F1, W1, S1
Directed Studies
(Same description as 49.590)

• Psychology 49.691F1, W1, S1
Independent Research
(Same description as 49.591)

• Psychology 49.693
Practicum in Psychology
The practicum offers graduate students experience in a range of applied psychology settings (for example, hospitals, schools, and correctional centres). Students participate in training sessions and work experience, facilitating the integration of academic and practical aspects of psychology. Details of current practicum placements are available from the department. This course cannot be repeated for credit. Students will receive a grade of satisfactory or unsatisfactory.

• Psychology 49.699F, W, S
Ph.D. Thesis

Through inter-university co-operation in graduate instruction, full-time graduate students registered in the Department of Psychology may enrol in one course at the University of Ottawa.

School of Public Administration

The School

Director of the School: A.M. Maslove
Supervisor of Graduate Studies: Eugene Swimmer

The School of Public Administration was established in 1953 through the assistance of a generous grant from the Atkinson Charitable Foundation.

The school offers two graduate programs of study and research in the field of administration. Prospective applicants are urged to evaluate these two opportunities carefully in order that they may select the one most suitable to their interests, background, and academic qualifications.

Diploma in Public Administration (D.P.A.)
This diploma program, which consists of five full courses or the equivalent, is more fully described below. It is designed to offer those persons in (or planning to enter) administrative careers an opportunity to begin acquiring some introductory exposure to subject matter related to administrative studies.

Master of Arts
The M.A. program is designed to provide a balanced exposure to both administrative studies and public policy. It is more fully described on the following pages.

Inquiries and requests for further information should be directed to the school.

Graduate Diploma in Public Administration

The Diploma in Public Administration is designed to offer those persons in (or planning to enter) administrative careers an opportunity to begin acquiring some introductory exposure to subject matter related to administrative studies. The program consists of five courses and may be taken on a part-time, full-time, or mixed part-time and full-time basis.

The program is based on the recognition that persons with widely varying backgrounds will enter it. Students who successfully complete the D.P.A. program may apply for admission to the M.A. program, at which time they will be considered for admission along with all other applicants. If all of the first-year courses are not taken as part of the D.P.A., they will be required in addition to the final M.A. courses.

Admission Requirements

Admission to the graduate program in public administration is selective. To be considered for admission, an applicant must have a bachelor's degree with at least high second-class standing from a recognized university, and must have completed courses in introductory economics (Economics 43.100 or the equivalent) and Canadian government and politics (Political Science 47.200 or the equivalent). If an applicant has not completed the economics and political science prerequisites, they must be completed in addition to the student's program, with a grade of C or better. All students who have completed the prerequisites (particularly if completed several years ago) will be expected to have a working knowledge of the material in these courses.

Applicants are advised to submit applications before July 1 as enrolment in the school is limited.

Program Requirements

The program consists of five full-course credits, at least four of which must be completed at Carleton. Advanced standing may be granted in one full course (or equivalent) if previous work is judged to be equivalent to courses required in the program. A student who has taken one (or more) of the other required courses prior to admission must substitute another course (or courses) in consultation with the supervisor of graduate studies. In the event that a part-time student is required by his/her employer to move away from Ottawa, he/she may apply to complete one full course or the equivalent at another university, provided that no transfer of credit was granted on admission.

Students are required to complete any five full courses from the following program:

- Admin. 50.500: Public-Sector Managing and the Canadian Political System
- Admin. 50.510: Management Accounting and Administration
- Admin. 50.511: Financial Management
- Admin. 50.522: Economics for Management and Policy I

- Admin. 50.523: Economics for Management and Policy II
- Admin. 50.530: Organizational Behaviour I
- Admin. 50.536: Law of Public Authorities I
- Admin. 50.550: Quantitative Methods
- Admin. 50.567: Public Sector-Private Sector Relations
- Admin. 50.568: Policy and Decision Making

Part-time students already admitted to the D.P.A. program under the provisions of previous calendars may adjust their programs to take advantage of the revised program outlined above.

Academic Standing

All candidates are required to obtain a grade of B- or better in each course in the program. A candidate may, with the recommendation of the school and the approval of the Faculty of Graduate Studies and Research, be allowed a grade of C+ in one half-course.

Master of Arts

The master's program is specifically designed to provide the prospective and the mid-career administrator with a balanced exposure to administrative studies and to public policy.

The contemporary manager or administrator is increasingly required to be both a policy adviser and formulator and to have a substantive understanding of the many disciplines and variables associated with the decision-making process in contemporary organizations. University programs can begin to provide some of the foundations that will enable persons to acquire an understanding of the broad financial, legal, economic, political, and social interrelationships that affect decisions in any organization.

The program is designed to prepare students for managerial, policy, and managerial-support roles in the public services of Canada (federal, provincial, regional, and municipal), and to accelerate and enrich the education and the development of those already performing such roles. Because it is conducted in conjunction with, and draws upon, a program of advanced research in administrative studies and public policy, it is also designed to meet the educational needs of those who wish to undertake graduate-level work in public policy and management, but who may not have a current commitment to public service careers.

Degree Schedules

The degree can be taken in one of three basic modes: full-time, part-time, or through a mixed part-time and full-time schedule:

- The Full-time Schedule

A full-time student can complete the program in two years (four academic terms), but typically may require a fifth (usually summer) term to complete the requirements, depending upon the amount of advanced standing granted for previous courses.

- The Part-time Schedule

A part-time student normally completes from two to four half-courses during the regular academic year, typically in evening courses. Certain courses are also available during the summer term. The duration of a part-time program normally varies from five to eight years.

- Mixed Part-Time and Full-Time Schedule

This schedule enables the student to alternate periods of full-time and part-time study. Typically, students will begin on a part-time basis, but may study on a full-time basis for at least one semester. Such full-time study, which may commence in either the fall, winter, or spring term, is especially suitable for practising mid-career administrators as it facilitates a flexible sequence for study and normal work periods.

Admission Requirements

To be considered for admission, an applicant must have a bachelor's degree (or equivalent) with at least high second-class standing from a recognized university, and must already have completed courses in introductory economics (Economics 43.100 or equivalent) and Canadian government (Political Science 47.200 or equivalent).

If an applicant has not completed the economics and political science prerequisites, they must be completed in addition to the student's graduate program, with a grade of C or better. All students who have completed the prerequisites (particularly if completed several years ago) will be expected to have a working knowledge of the material in these courses.

Applicants are advised to submit applications before July 1 as enrolment in the school is limited.

The school also gives special consideration to mid-career applicants. To qualify for mid-career admission, applicants must have spent several years in one of the public services, or be performing managerial or related functions in a private-sector organization and have demonstrated excellence in their performance in these organizations.

The school's admission policy will, of course, be governed by the availability of graduate student space and the need to admit applicants from a variety of disciplines and backgrounds (for example, social sciences, humanities, law, engineering, or science). Possession of the minimum admission requirements does not, in itself, guarantee acceptance.

Advanced standing may be granted for required courses only if previous work is judged to be equivalent to courses required in the program. Advanced standing and transfer of credit must be determined on an individual basis in consultation with the director, and must also be approved at the time of admission by the dean of the Faculty of Graduate Studies and Research. In general, a grade of B- or better is required in equivalent courses to obtain advanced standing.

Program Requirements

The M.A. program comprises 20 half-courses (or the equivalent).

Students generally begin their program with required courses; it is possible, however, to take a mixture of optional and required courses throughout both years, provided that the student has the necessary prerequisites for any specific options selected.

Required Courses

- Admin. 50.500: Public-Sector Managing and the Canadian Political System
- Admin. 50.510: Management Accounting
- Admin. 50.511: Financial Management
- Admin. 50.522: Economics for Management and Policy I
- Admin. 50.523: Economics for Management and Policy II
- Admin. 50.530: Organizational Behaviour I
- Admin. 50.536: Law of Public Authorities I
- Admin. 50.550: Quantitative Methods
- Admin. 50.567: Public Sector - Private Sector Relations
- Admin. 50.568: Policy and Decision Making

Students who have successfully completed the requirements for the Diploma in Public Administration and who are unable to continue their M.A. program may be awarded the diploma, provided that four full courses have been taken at Carleton University.

Optional Courses

- One half-course selected from Stream 1 listed below, and
- Two half-courses selected from Stream 2 listed below, and
- Six half-courses selected from any of the three streams listed below, *or*
- A thesis (equivalent to four half-courses) and two half-course options, *or*
- A research essay (equivalent to two half-courses) and four half-course options

Stream 1 — Public Policy Analysis

Administration

50.501 Policy and Administration in Intergovernmental Relations
50.502 The Political Economy of Regulation
50.513 Budgeting and Decision Theory
50.565 Government-Industry Policy Relations
50.566 Science and Technology Policies
50.569 Advanced Policy and Decision Theory
50.570, 571, 572, 573 Policy Seminars
50.574 Urban Policy Analysis
50.575 Advanced Statistical Policy Analysis

Stream 2 — Public Management

Administration

50.514 Public-Sector Accounting and Finance
50.515 Management in the Public Service
50.516 Urban and Local Government Management
50.517 Public Management in Developing Countries
50.519 Management of Public Enterprise
50.520 Public-Sector Investment and Pricing
50.528 Management Information Systems I

50.529 Management Information Systems II
50.531 Organizational Behaviour II
50.537 Law of Public Authorities II
50.538 The Management of Provincial Government
50.562 Planning and Evaluation in Government I
50.563 Program Assessment Design
50.581 Staffing and Personnel Management
50.583 Problems in Organizational Change and Development
50.584 Industrial Relations and Public-Sector Collective Bargaining
50.585 Public-Sector Collective Bargaining

Stream 3 — Recommended Options Offered by other Carleton Departments and Schools and by the University of Ottawa*

Economics
43.505 Econometrics
43.511 Canadian Economy I
43.532 Competition Policy
43.533 Regulation and Public Enterprise
43.541 Public Economics: Expenditure
43.542 Public Economics: Taxation
43.547 Project Evaluation
43.555 The Economics of Development
43.581 Regional Analysis
43.582 Urban Analysis

Journalism
28.434 Media and Society I
28.435 Media and Society II
28.462 Public Issues in Canada
28.532 Press and Government

Law
51.441 Labour Law
51.445 Labour Relations in the Public Service
51.450 Canadian Constitutional Law
51.556 Advanced Administrative Law Problems

International Affairs
46.500 International Integration
46.510 Canada's International Policies
46.525 International Financial and Monetary Institutions and Policy
46.530 The International Enterprise
46.532 Science, Technology, and International Affairs — Analytical Approaches

Management Studies
42.518 Marketing for Non-Profit Organizations

Political Science
47.500 Canadian Local Government and Politics
47.501 Canadian Provincial Government and Politics
47.508 The Politics of Energy and the Environment
47.544 Public Administration in Developed Western Countries
47.545 Public Administration in Developing Countries
47.547 Decision Theories and Policy Studies
47.561 Analysis of Canadian Foreign Policy

Social Work
52.511 Social Policy Analysis
52.514 Housing Policy
52.515 Poverty and Wealth
52.540 Social Administration and Policy
52.541 Management of Social Programs
52.551 Program Evaluation

Sociology and Anthropology
53.525 Canadian Society
53.526 Sociology of Occupations and Professions
53.527 Sociology of Formal Organizations
53.529 Sociology of Science and Technology
53.530 Social Institutions I: Economics and Society
53.531 Social Institutions II: Labour Process
53.540 Political Sociology

University of Ottawa
MSG 6131 Quantitative Models for Manpower Planning
MSG 6317 Human Resources Policy
MSG 6161 Topics in Behavioural Sciences
MSG 6103 Managerial Accounting II
MSG 6115 Advanced Managerial Economics
MSG 5106 Management Science I
MSG 5116 Management Science II

*This is not a complete list of all the acceptable options. Students should contact the supervisor of graduate studies or the director for approval if there are other courses they wish to take which are not on this list.

MSG 6113 Decision Theory
MSG 5109 Marketing
MSG 6109 Marketing Research

Academic Standing

All candidates are required to obtain a grade of B- or better in each course in the program. A candidate may, with the recommendation of the school and the approval of the Faculty of Graduate Studies and Research, be allowed a grade of C+ in one half-course.

Compulsory Courses*

• Administration 50.500F1
Public-Sector Managing and the Canadian Political System
An examination of the central features and influences of the Canadian political system on public service managerial and policy roles. An examination of the application of managerial concepts and approaches in Canadian public administration.
Prerequisite: Political Science 47.200.
V.S. Wilson, Michael Prince, and D.G. Swartz.

• Administration 50.510F1, W1
Management Accounting
An introduction to the underlying assumptions and basic principles of accounting, and an examination of the uses of accounting information by management. Topics include income measurement, asset valuation, financial statement analysis, cost systems, control reports, operating budgets, capital expenditure decisions, and alternative choice problems.

• Administration 50.511F1, W1
Financial Management
An examination of the principles and practice of financial planning and control. Analysis of the problems of resource allocation and asset management under conditions of uncertainty. Techniques of capital expenditure analysis, and analysis of funds flow.
Prerequisite: Administration 50.510.
J.R. Callaghan.

• Administration 50.522W1
Economics for Management and Policy I
An examination of macroeconomic theory and policy, with emphasis on the theoretical foundations of contemporary policy debates.
Prerequisite: Economics 43.100.
George Warskett and Stanley Winer.

• Administration 50.523F1
Economics for Management and Policy II
An examination of microeconomic theory and policy, with attention to public sector economics.
Prerequisite: Economics 43.100.
A.M. Maslove, George Warskett, and Stanley Winer.

• Administration 50.530W1
Organizational Behaviour I
An examination of basic theories and approaches to the motivation of workers in organizations, the analysis of individual behaviour in organizations from the perspective of worker motivations, and the examination of current tools, such as job enlargement participation models and M.B.O. for improving worker motivation and coping with organizational change.
D.G. Swartz, V.S. Wilson, and Michael Prince.

• Administration 50.536F1, W1
Law of Public Authorities I
Introduction to basic legal principles, structures, and processes for the public administrator. Character of law and public law; constitutional framework; legal sanctions and basic principles of legal control. Statutory discretion from the administrator's point of view.
R.D. Abbott.

• Administration 50.550T2
Quantitative Methods
An introduction to the theory of measurement and various methods of data collection and causal analysis. Under the guidance of the instructors, students are expected to devise their own research designs, and analyze empirical data with the use of the computer.
Eugene Swimmer and Sharon Sutherland.

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

• Administration 50.567F1
Public Sector - Private Sector Relations
An examination of basic theories and interpretations regarding the roles of, and interrelationships among, the state, corporations, labour unions, the professions, and other elements of the private sector.
Prerequisite: Administration 50.500.
Rianne Mahon, G.B. Doern, and Sharon Sutherland.

• Administration 50.568F1
Policy and Decision Making
An introduction to major political, economic, and organizational theories of policy and decision making, and their relationship to applied policy analysis.
G.B.Doern and Rianne Mahon.

Optional Courses

• Administration 50.501T2
Policy and Administration in Intergovernmental Relations
An examination of the major cost-sharing and fiscal transfer agreements, and the intergovernmental mechanisms for policy and administrative co-ordination. Also examined are selected substantive program areas, such as immigration, cable television, manpower training, regional economic development, energy and natural resources, and other contemporary topics.
V.S. Wilson.

• Administration 50.502F1
The Political Economy of Regulation
An examination of political, economic, legal, and organizational theories of regulation in the Canadian and comparative context, and of the processes and consequences of regulatory practice in selected Canadian public policy fields.
G.B. Doern.

• Administration 50.513W1
Public Decision Making and Budgeting
An analysis of budgets (federal, provincial, and local) viewed as the outcome of the interaction of voters, politicians, and public administrators. An understanding of this interaction is acquired by building analytical models of it, paying particular attention to the incentives that are embedded in our political and economic institutions. Student papers are oriented towards critical review of actual government budgets and budgeting processes.
Stanley Winer.

• Administration 50.514W1
Public-Sector Accounting and Finance
An examination of selected problems in accounting and financial management in public-sector organizations.

• Administration 50.515F1
Management in the Public Service
An examination through cases and research of selected problems and issues in public service management. The specific focus of the course will change each year; some topics include human resources management, government investment, and pricing decisions.

• Administration 50.516W1
Urban and Local Government Management
An analysis of the principal issues and processes of Canadian urban and local government management and administration.
Michael Prince.

• Administration 50.517W1
Public Management in Developing Countries
An applied analysis of selected issues in public management and administration in developing countries.
N.H. Lithwick.

• Administration 50.519W1
Management of Public Enterprise
An examination of the theory and practice of public enterprise, drawing on both Canadian and comparative experience. The seminar examines selected federal and provincial crown corporations, and mixed enterprises, such as Air Canada, CNR, AECL, Telesat Canada, and the Canada Development Corporation.

• Administration 50.520F1
Public-Sector Investment and Pricing
An examination of theory and practice related to decision making about public-sector investment and pricing policy, particularly in connection with large-scale projects and programs. The focus is applied cost-benefit analysis (discount rates,

marginal cost and shadow pricing, and the handling of risk and uncertainty) in large-scale public investment choices.

• Administration 50.528F1, W1
Management Information Systems I
An examination of the fundamentals of MIS: the nature of systems, information, and management processes, including concepts of data-processing technology, systems design, organizational impacts of information systems, and hardware and software considerations.

• Administration 50.529W1
Management Information Systems II
An examination of information and decision networks in complex organizations. The course will employ case studies, assignments, and lectures to illustrate MIS tools and concepts, including general systems theory, information theory, and decision models. Security issues will be discussed.
Prerequisite: Administration 50.528.

• Administration 50.531W1
Organizational Behaviour II
An examination of macro open-systems theories of behaviour of organizations, including inter-agency and agency-clientele relations and accountability processes. Students examine through research papers different modes of organization, including ministry systems, state enterprise, mixed enterprise, regulatory boards, and service and custodial organizations.

• Administration 50.537F1
Law of Public Authorities II
Characteristics and problems of control of administrative action. Varieties of legal control, judicial review, discretion, privative provisions and damages, appelate control, statutory reform.

• Administration 50.538W1
The Management of Provincial Government
A comparative analysis of public-sector management structures and processes at the provincial level of government. Topics examined include personnel and financial systems, regional administration, public utilities, direct interprovincial program and project management, and international activities of provinces.

• Administration 50.562F1, W1
Planning and Evaluation in Government I
An examination of selected concepts, issues, and processes in applied governmental planning and evaluation, utilizing both Canadian and comparative experiences.
Sharon Sutherland.

• Administration 50.563F1
Program Assessment Design
An application of appropriate evaluative concepts to a public program or project in a bureaucratic setting. Working closely with the instructor, the student will design a feasible study/review of a program or project. Additional training in suitable methodologies will be acquired. The number of students will be limited to the number of appropriate programs/projects in co-operating government departments available in any one year.
Prerequisite: Administration 50.562.
Sharon Sutherland.

• Administration 50.565T2
Government-Industry Policy Relations
An examination of the main policies, programs, and strategies of those government departments (federal and provincial) which have the most direct interface with the industrial and corporate sector in Canada. These departments include Industry, Trade and Commerce, Treasury and Economics, Consumer and Corporate Affairs, etc.
George Warskett and Rianne Mahon.

• Administration 50.566S1
Science and Technology Policies
An examination of Canadian programs, policies, and strategies toward the development of scientific and technological capability, and towards the use of science and technology in social and economic programs.

• Administration 50.569W1
Advanced Policy and Decision Analysis
Advanced critical analysis of organizational, political, and economic theories of public-sector decision making, including the choice of policy instruments, collective action, constitutional and institutional design.
A.M. Maslove.

• Administration 50.570T2
Policy Seminars
An examination of one or more selected policy areas. The focus will be an analytical assessment of the selected policy area in terms of its many-sided economic, political, social, legal, quantitative, and administrative complexities. The policy field will change each year.

• Administration 50.572F1, W1, 50.573S1
Policy Seminars
An examination of one or more selected policy areas. The focus will be an analytical assessment of the selected policy area in terms of its many-sided economic, political, social, legal, quantitative, and administrative complexities. The policy field will change each year.

• Administration 50.574F1
Urban Policy Analysis
An analysis of the urban policies of all three levels of government in Canada and their interactions. The course examines policy processes as well as a number of substantive urban policy issues.
N.H. Lithwick.

• Administration 50.575F1
Advanced Statistical Policy Analysis
An examination of econometric research on selected policy issues. The issues considered vary each year and the analysis incorporates the study of selected econometric techniques. The course enables students to evaluate critically applied econometric studies of public policy.
Stanley Winer.

• Administration 50.581W1
Staffing and Personnel Management
An examination of the staff and personnel-management functions in large public and private organizations, including recruitment, selection and performance appraisal, reward systems, and the roles of staffing professionals.
Kenneth Cox.

• Administration 50.583F1
Problems in Organizational Change and Development
An examination, through case work and group projects, of the concepts and issues of planned organizational changes.

• Administration 50.584F1
Industrial Relations and Collective Bargaining
An analysis of the basic concepts of industrial relations, with respect to both public- and private-sector employees and organizations.
Eugene Swimmer.

• Administration 50.585W1
Public-Sector Collective Bargaining
An application of the basic concepts, legislation, and public policies regarding public-sector collective bargaining at the federal, provincial, and municipal levels of Canadian government. Cases and simulated negotiations will be used where appropriate.
Prerequisite: Administration 50.584 or permission of the school.
Eugene Swimmer.

• Administration 50.590T2
Directed Studies
A tutorial or directed reading course on selected subjects.

• Administration 50.591F1, W1, S1
Directed Studies
A tutorial or directed reading course on selected subjects.

• Administration 50.598F2, W2, S2
Research Essay

• Administration 50.599F4, W4, S4
M.A. Thesis

School of Social Work

The School

Director of the School: Leonard Rutman
Supervisor of Graduate Studies: To be announced

The School of Social Work, accredited by the Canadian Association of Schools of Social Work in 1977, offers a graduate program leading to the degree of Master of Social Work. The program may be completed through full-time or part-time study.

Master of Social Work

The Master of Social Work program is based on an analytical and critical approach to social work practice, and to knowledge related to practice. The program examines the structural context of personal and social problems, and of social work practice. The structural context refers to the interaction between the personal and the social, political, and economic aspects of such problems. The program focuses on the development of forms of practice predicated on this notion, referred to as structural approaches, seeking to intervene to change the nature of the interaction between people and their structural context.

The school's orientation explicitly includes approaches to social problem solving, social development, and social change, which involves working directly with individuals and groups. This includes a strong emphasis on sensitivity to the individual, and on the development of new and innovative strategies for working with individuals in their environments. The school also stresses community analysis and an awareness and knowledge of the social policies that affect the lives of many people in our society.

The program of the school offers two major social work intervention areas. The first area is related to direct practice with individuals, families, groups, and communities. Pressures of society are contributing to the toll of family and individual suffering. Traditional primary institutions such as the family are undergoing modification, and in many cases they no longer provide needed support. It is hoped that skilled social work practitioners can help families, individuals, and communities through some of the crises, and help them effectively to address the personal and societal pressures they are facing.

The second major area of study is social administration and policy. There is a growing awareness that social work should be more involved in the development of social policies, in the operation of large scale social programs, and in policy analysis and research. Since the school is well situated in the nation's capital, it has a wealth of resources in the social-policy and program arenas to draw upon.

The program includes the following major curriculum segments:

- An understanding of social structure and individual and collective behaviour
- An understanding of the methods and processes of social work intervention
- An understanding of the social policy process and social work's participation in it
- Research knowledge and skills, and their application to questions dealing with social work practice, with particular emphasis on the evaluation of social work practice and programs
- Field work, an opportunity for students to test out aspects of the academic curriculum within a practice setting, and to work with professionals involved in social work and related fields.

Part-Time Degree Program

The school also has a small part-time degree program in operation; a limited number of candidates are admitted to this program each fall. It is anticipated that the part-time program will attract competent candidates who, due to a range of circumstances, cannot participate in a program of full-time study. M.S.W. requirements in the part-time program are identical to the regular program, and the course offerings and timetable for part-time students are the same as for full-time students. Part-time students are permitted to enrol in a maximum of two half-courses per term. They have up to eight years to complete the program.

Admission Requirements

Admission to the school is on a selective basis.

All applicants will have received their bachelor's degree, or be in their final year of undergraduate study prior to graduating from a recognized uni-

versity; a high second-class standing at the undergraduate level is expected. Applicants must present a one-credit course in basic research methods, and they should have a background in the social sciences. Preference will be given to candidates with related work experience.

Applicants with a B.S.W. degree, or graduate work in a related discipline, are considered individually for advanced standing in the program.

Application is made on the forms available from the admissions office at the School of Social Work; all applications should be received at the school by *February 1*.

Social Science Requirement

Applicants with degrees in the humanities or related fields may be required to take make-up courses in the social sciences. Courses that address societal and personal issues will be considered as equivalent: for example, society, value, and technology; social and political philosophy; social history of Canada; contemporary Canadian cultures; media and society; public issues in Canada; and contemporary labour problems.

Research Requirements

Courses stressing logic of inquiry will be given preference. These may include courses in quantitative and/or qualitative research, philosophical as well as historical approaches to inquiry, and the standard social science research courses.

Program Requirements

Candidates for the Master of Social Work degree must complete 10 full credits of course work (or the equivalent).

All students must complete the courses Social Work 52.500 or 52.506, 52.510, either 52.551 or 52.552 (or one of the specified substitutes below), 52.561 (following the completion of four full credits taken in the school, which must include Social Work 52.500 or 52.506, 52.510, and either Social Work 52.520 or 52.540, or a substitution if advanced standing for any of these is granted) and Social Work 52.590.

Electives across the program, totalling 3½ credits, are to be accomplished through either a second (two-credit) field placement and the equivalent of 1½ credits of course work, or 3½ credits of optional course work from across the program.

In addition, *Direct Intervention* students must take Social Work 52.520 and two half-credits from 52.501 to 52.509, 52.521 to 52.529; and *Social Administration and Policy* students must take Social Work 52.540 and two half-credits from 52.501 to 52.509, 52.511 to 52.519, 52.541, 52.542.

Substitutes for Social Work 52.551 or 52.552 are: Sociology 53.512, and 53.513: Statistical Methods I and II; Anthropology 54.541: Anthropological Methods; Public Administration 50.550: Quantitative Methods; Public Administration 50.562, and 50.563: Planning and Evaluation in Government I and II; Psychology 49.510 and 49.511: Research Methods in Social Psychology I and II; Psychology 49.545: Quantitative Psychology; Psychology 49.570: Research Methods in Learning; Political Science 47.570: Advanced Research Methods; Economics 43.505: Econometrics; Economics 43.592: Empirical Methods; and History 24.588: Historiography.

Academic Standing

The school operates within the evaluation and grading system of the Faculty of Graduate Studies and Research.

Graduate Courses*

Human Behaviour and Structural Context

- Social Work 52.500F1

Human Behaviour and Structural Context

A general framework for the utilization of social science theory in social work practice is presented, reviewing major contributions from individual and social psychology, and from social, political, and economic theory toward the understanding of the interaction between the personal and the larger social system aspects of problems confronted by social work practitioners. A major analytic

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

focus of the course is the position of women in the family, the paid labour force, and the social services.

• Social Work 52.501F1
Community Structure
Examination of various theories of community behaviour and structure, developing a general framework for understanding the complexity of community behaviour, related to community practice.

• Social Work 52.502W1
Economics of Welfare
An examination of economic aspects of social policy, critically examining several theoretical approaches to the role of government in the financing of social policy. Review of the growth of federal government spending on social welfare, and an examination of the federal tax system and selected social welfare policies.

• Social Work 52.503W1
Foundations of Sexuality
A critical examination of psychological, social psychological, and sociological theories about the nature of human sexuality, and sexual identity and interaction.

• Social Work 52.504F1
Social Work and the Law
Examination of the legal context within which social policy is developed, social programs presented, and social work practised, clarifying the philosophical basis of Canadian law, the relationship between law and the state, and the expression of the law in the judicial system. Special attention is given to a critical analysis of legislation concerning families and children.

• Social Work 52.505W1
Organizational Behaviour
Examination of contemporary theories and research related to organizational behaviour and change, focusing on bureaucratic and open systems theory towards the critical analysis of complex social organizations, and examining the relevance of such theory to organizations in the social welfare field.

• Social Work 52.506F1
Women and Welfare
This course aims to stimulate and develop critical appreciation of the changing status of women in Canadian society, in specific relation to the field of social welfare, and to develop awareness of the importance of sex differentiation as a key determinant in society. Using women as a primary source of data, the course will examine women as the major providers and consumers of the social services. It will also analyze the implications of social policy decisions for women. Thus, the importance of gender stratification as a major problematic inherent in traditional theories of social class, political economy, the state, ideology, and psychology will be explored. The resultant implications for professional practice at both direct-intervention and social-policy levels will be considered.

• Social Work 52.507F1
Foundations of Direct Intervention Practice
This seminar traces the philosophical and historical evolution of the competing paradigms underlying contemporary social work practice, with individuals, families, and collectivities. Most of the analytical content will be drawn from the philosophy of science and from the sociology of knowledge.

• Social Work 52.508W1
Social Deviance and Social Control
A consideration of classical and contemporary theories of deviance, elucidating the nature and theoretical bases of ideas about social problems which are of concern to social workers.

• Social Work 52.509F1, W1
Selected Topics in Human Behaviour
Seminar on a special topic, presented by a faculty member or a visiting professor. The seminar is based on current interests of faculty and students, and availability of special expertise.

Social Policy Analysis

• Social Work 52.510W1
History and Philosophy of Social Welfare
An historical perspective on the development of social welfare policies and the practice of social work, presenting an analysis of such matters as the functions of welfare institutions, the historical relationships between welfare and work, the

nature and terms of social provisions, the contrast between residual and institutional welfare policies, and the development of social work practice.

• Social Work 52.511F1
Social Policy Analysis
Based on a framework for the analysis of social problems, the course offers conceptual, theoretical, and empirical tools for the analysis of social policies in meeting social needs or resolving social problems in Canadian society.

• Social Work 52.513F1
Personal Social Services
Examination of a number of issues related to personal social services, including government jurisdiction, financing, access, rationing, present organizational structures, and the nature of services provided. Major current developments are examined, and a perspective on the future of personal social services developed.

• Social Work 52.514F1
Housing Policy
An introductory analysis of the economic and social aspects of housing. Issues include the nature of property, housing finance and construction, rent control, land assembly and development, and housing rehabilitation; also covers the genesis and current state of housing policy at all three levels of government, and the effect of government policy on the distribution of housing.

• Social Work 52.515F1
Poverty and Wealth
Critical examination of theories of poverty and wealth, in an attempt to explain the existence of poverty and the unequal distribution of income and wealth in Canada, then using the perspective developed to focus on existing and prospective Canadian social policies, such as guaranteed annual income schemes and wealth taxation.

• Social Work 52.516W1
Mental Health Policies
An examination of the major issues and questions faced by practitioners, researchers, and planners in considering public policy decisions in the mental health field, including issues of authority and equality, values, and political aspects.

• Social Work 52.517W1
Social Policies for Children
A critical examination of social policies in Canada specifically directed towards children, and their underlying social bases in relation to the economic system, the family, and child-rearing practices.

• Social Work 52.518W1
Seminar on a Selected Service Field
In any one year, two additional half-credit social policy analysis courses may be offered, focusing on particular fields of service, such as corrections, mental health services, children's services, or health care services, and examining current programs, historical developments, and the major current issues or developments.

• Social Work 52.519F1, W1
Seminar on a Selected Service Field
(Same description as 52.518)

Direct Intervention

• Social Work 52.520T2
Direct Intervention
Presentation of a structural framework for social work practice, consonant with the changing paradigm underlying the profession over the past decade, articulating a model of practice, and examining the following aspects of the framework: assessment and interventive approaches; development of analytical and interactional skills; the helping process. Research questions and implications will be continually identified.

• Social Work 52.521W1
Individual and Family Intervention
The development of practice knowledge and skill related specifically to intervention with individuals and with families, examining the implications for assessment and intervention of a structural approach to working with individuals and families, and directing attention to the differential use of current techniques of intervention.
Prerequisite: Social Work 52.520.

• Social Work 52.522F1
Models of Practice with Individuals and Families
Comparative and critical analysis of contemporary models, that is, "approaches", "intervention methodologies", etc., currently proposed in direct practice. An analytical framework is presented

which examines the problems of selection and relevance of such models for a structural approach to practice.

• Social Work 52.523F1
Principles of Group Development
Group development refers to the changes through time in the internal structures, processes, and culture of the group. Based on the assumption that the group is a vehicle in all practice modalities, and that the role of the group leader is that of developing the group to do its own work, the course draws on small-group theory and group-practice theory.

• Social Work 52.524W1
Differential Application of Group Development
Examination of the application of group development skills in a variety of settings, with the concept of group development as a unifying theme; identifying significant interactional variables to form a comparative framework. The student will acquire knowledge in breadth, pertaining to the differentiation of group contexts, as well as knowledge in depth, pertaining to a selected group context. *Prerequisite:* Social Work 52.523 or equivalent.

• Social Work 52.525W1
Building an Organization
The theory and practice of organizing for social action in a variety of contexts: at the theoretical level, the concern will be when and on what basis to organize. Specific attention is then given to organizing at the community and the institutional levels, and organizing national pressure groups around social policy issues. The development of skills will be undertaken in contacting the potential constituency, in constitution making and running meetings, negotiating, fund raising, public relations, building support among members, and planning effective actions to achieve or publicize organizational aims.

• Social Work 52.526W1
Models of Community Practice
Presentation of a framework for analysis of community problem definition, and working this through goal setting, decision making, action strategies, tactics and evaluation, affording a detailed examination of four major community intervention roles: enabler, organizer, developer, and advocate. The concept of citizen participation is also examined.

• Social Work 52.527F1
Case Studies in Community Practice
This course is concerned with community action in Canada, based on case studies of Canadian experiences, and providing a broad perspective of the types of citizen action and intervention in community processes; emphasis will be placed on practice, relating concepts developed to the past, present, and emerging reality of community work in Canada.

• Social Work 52.528W1
Feminist Counselling
A critical examination and analysis of approaches to women's problems by the helping professions in general, and social workers in particular, emphasizing the developing theory, practice, and literature of feminist counselling which endeavours to combine the personal and political aspects of women's experiences and alternative forms of helping.

• Social Work 52.529W1
Intervention with Children and Youth
Examines preventative and protective social work intervention with children and youth, analyzing the problems involved in neglect, violence, and abuse, crisis situations, wardship, "taking-into-care", and problematic behaviours, in the context of the epigenetic stages of maturation, the family in its diverse forms, and the social-political context in Canada.

• Social Work 52.530W1
Social Change and Social Welfare
Exploration and analysis of the major factors in social change, drawing on the relevant work of major social theorists, and on writers such as Gorz, Alinsky, and Freire, who have directed themselves more explicitly to issues faced by social workers.

Social Administration and Policy

• Social Work 52.531W1
Social Work with People in Conflict with the Law
An analysis of the theoretical framework and social work practice within the Canadian law enforcement apparatus and correctional services.

The course emphasizes the role and participation of social work in new areas which deal with the problems of juvenile delinquency and crime.

• Social Work 52.532F1
Cognitive Approaches to Social Work Practice
An examination of a framework for cognitive and behavioural methods which allows critical analyses as well as intervention in the different areas of social work practice. This examination focuses on the link between the behaviour of the client systems (individuals, families, communities, and organizations) and the social structures, processes, and values which occasion it and which must be considered for effective service.

• Social Work 52.540T2
Social Administration and Policy
An introductory methods course, providing an understanding of the values and knowledge required for the effective performance of policy and planning roles in organizational and community settings, covering need assessment as well as administrative, policy, and planning methods, with an emphasis on social welfare and health agencies as the system context for practice.

• Social Work 52.541W1
Management of Social Programs
Development of intervention and analytic skills through concern with the nature of management in the public and voluntary sector, approaches to more effective utilization of organizations and more effective mechanisms for the delivery of human services. Topics include managerial effectiveness, decision-making methods and tools, models of managerial behaviour, and the design of resource requirements, including budget development.
Prerequisite: Social Work 52.540.

• Social Work 52.543W1
Supervision of Direct Practice
An analysis of the functions performed in the supervisory role in human service organizations, consideration of differential models of supervision, and examination of problems and issues in social work supervision.

• Social Work 52.544F1
Program Implementation Analysis
An examination of factors affecting social program implementation, and issues pertaining to the translation of policies and plans into program realities.

• Social Work 52.545W1
Industrial Relations and Social Work
The purpose of this course is to examine the relationship of employer and employee in social work. This requires an examination of the rise of human services and social work in particular, concomitant with development of a capitalist economy. It also requires an understanding of the development of an industry, unionization, and state intervention in industrial relations in order to situate social work in context. An examination of the current structure of unions and industrial relations legislation sets the stage for more detailed study of the growth of unionism, wages and conditions, contract bargaining, and particular contracts in social work. Particular contracts and conflicts are also examined.

• Social Work 52.549F1, W1
Special Seminar in Social Work Intervention
A special half-credit seminar in intervention may be offered each year, on a particular topic relevant to current interests of faculty and students (or a visiting professor), in either Direct Intervention or Social Administration and Policy.

• Social Work 52.551W1
Program Evaluation
Relying on principles of basic research methods, this course will focus on the issues of planning and conducting research which aims to determine the effects of social programs. Topics include purposes of evaluative research, articulating program components, goal specification, development of measures, experimental and quasi-experimental design, and utilization of findings.

• Social Work 52.552W1
Evaluation of Direct Intervention
Development of a beginning awareness of issues and skills involved in the evaluation of intervention with individuals, families, small groups, and communities. Moving from philosophical and sociopolitical research perspectives, the seminar focuses on the development of evaluative criteria and

analytical frameworks which could be used to determine the relevance and the effectiveness of intervention.

Field Practice — Full-Time

- Social Work 52.561F4, W4, S4

Field Practice I
The field placement facilitates the integration of the academic and practical aspects of social work education, providing the opportunity for students to test theory and practice models dealt with in the academic curriculum, and to learn professional responsibility in self-directed learning practice skills; includes a bi-weekly field seminar.
Offered in spring term subject to availability of faculty.

- Social Work 52.562F4, W4, S4

Field Practice II
(Same description as 52.561)

Field Practice — Part-Time

- Social Work 52.563F2, W2, S2

Field Practice I
(Same description as 52.561)

- Social Work 52.564F2, W2, S2

Field Practice II
(Same description as 52.561)

Independent Enquiry Project

- Social Work 52.590F2, W2, S2

Independent Enquiry Project
The IEP is designed to contribute to the preparation of social work practitioners through the development of skills in planning and conducting research relevant to social work practice. The IEP should include some common elements: formulation of a question; a rationale for the importance of the question; theoretical basis for investigating the question. Various research approaches and styles may be used. The student works with a faculty research adviser and the proposal is reviewed by a project reader.

- Social Work 52.591F1, W1, S1

Tutorial on a Selected Topic
Tutorial or reading course on a selected topic.
Offered in spring term, subject to availability of faculty.

- Social Work 52.592F4, W4, S4

Independent Enquiry Project/Thesis
In special cases where resources permit, students will be allowed to undertake a two-credit independent enquiry project, instead of the one-credit independent enquiry project, Social Work 52.590.

Courses Not Offered in 1983-84

52.550 Research Planning Seminar

The Department

Chairman of the Department: Gordon Irving
Departmental Supervisor of Graduate Studies: John de Vries
Associate Supervisor of Graduate Studies: Jacques Chevalier

The Department of Sociology and Anthropology offers programs of advanced study and research leading to the M.A. and Ph.D. degrees in Sociology, and to the M.A. in Anthropology.

The principal focus of departmental interest in sociology at the graduate level is comparative social organization, with complementary specialization in the study of social demography-ecology and theory-methodology. The research emphasis is on industrial and industrializing societies. The institutions of Canadian society—in particular, class, ethnic, political, and regional structures—are examined in historical and comparative perspective.

The principal focus of the anthropology graduate program is the exploration of current developments in analysis and theory. This emphasis upon theory and methodology leads to the exploration of such alternative approaches to anthropological analysis as functionalism, Marxism, behaviourism, and structuralism, among others. There is a strong ethnographic component, with particular emphasis on North American studies and a secondary emphasis on Africa.

The current activity of the members of the department is as follows:

Comparative Social Organization

Comparative Societies
Wallace Clement, John Harp, B.A. McFarlane, Dennis Olsen, Adam Podgorecki, A.D. Steeves, D.R. Whyte

Comparative Institutions
Wallace Clement, Colin Farmer, D.P. Forcese, Muni Frumhartz, John Harp, F.K. Hatt, Florence Hughes, Gordon Irving, John Myles, Adam Podgorecki, Stephen Richer, Ian Taylor, F.G. Vallee

Occupations and Formal Organizations
C.C. Gordon, D.P. Forcese, F.K. Hatt, Judah Matras, Hugh McRoberts, A.D. Steeves

Social Stratification and Mobility
Monica Boyd, Wallace Clement, D.P. Forcese, F.K. Hatt, Judah Matras, Hugh McRoberts, A.D. Steeves

Social Anthropology

Valda Blundell, Jacques Chevalier, J.J. Cove, B.A. Cox, Jared Keil, Charles Laughlin, Joseph Manyoni, J.I. Prattis, D.G. Smith, V.F. Valentine, F.G. Vallee

Social Demography-Ecology

Monica Boyd, Judah Matras, John de Vries

Theory-Methodology

Hyman Burshtyn, Jacques Chevalier, D.P. Forcese, B.D. Johnson, Hugh McRoberts, Gertrud Neuwirth, T.A. Nosanchuk, J.I. Prattis, John de Vries, Caryll Steffens, D.R. Whyte

The Department of Sociology and Anthropology has access to the Canadian Institute of Public Opinion poll data and the Human Relations Area Files, and is a member, in co-operation with other social science departments, of the Inter-University Consortium for Political Research. Other data sets and archival holdings are also available in the department. Because of the location in Ottawa of Statistics Canada, the National Museum, the National Library, the National Science Library, the Public Archives, and the headquarters of many government departments, the city is an excellent base of operations for sociological research.

The graduate program in anthropology enjoys an especially close relationship with the sociology graduate program and, while certain members of the department are primarily identified as anthropologists, a number of sociologists may also be called upon for particular contributions to the program. There are other valuable resources in the Norman Paterson School of International Affairs and the Committee on African Studies.

Qualifying-Year Program

Applicants with general (pass) bachelor's degrees may be admitted into a qualifying-year program designed to raise their standing to honours status. Students earning at least high second-class standing in their qualifying-year courses will be considered for admission into the master's program.

Refer to the general section of this calendar for details of the regulations governing the qualifying year.

Master of Arts in Sociology

Admission Requirements

The requirement for admission into the master's program is an honours B.A. (or the equivalent) with at least high second-class standing.

Program Requirements

Master's students in sociology are required to select and follow one of the optional program patterns below, chosen in consultation with a graduate adviser:

Thesis Program

- Three full courses (or the equivalent); under certain circumstances one of the courses may be selected from those offered at the senior undergraduate level. Sociology 53.589 is highly recommended, especially for students who at the time of registration have not decided on a thesis topic.
- A thesis equivalent to two full-course credits
- An oral examination on the candidate's thesis and program.

Course Work Program

- Five full courses (or the equivalent) excluding Sociology 53.595; under certain circumstances one of the courses may be selected from those offered at the senior undergraduate level.
- Written and oral examination in the candidate's area of specialization and program (Sociology 53.595).

Academic Standing

A grade of B- or better must normally be obtained in each course counted toward the master's degree. With the recommendation of the department, a candidate may be allowed a grade of C (but not C-) in one full course or each of two half-courses.

Master of Arts in Anthropology

Admission Requirements

The requirement for admission into the master's program is an honours B.A. (or the equivalent) with at least high second-class standing.

Program Requirements

Master's students in anthropology are required to select and follow one of the optional program patterns below, chosen in consultation with a graduate adviser:

Thesis Program

Three full courses (or the equivalent) to include:

- Anthropology 54.541
- Anthropology 54.542
- Two additional credits selected from the anthropology graduate course offerings; from courses offered in the sociology graduate program (especially in theory and methods); from 400-level courses offered in the sociology and anthropology undergraduate program (with permission of the graduate committee); or any combination of these selected in consultation with the student's graduate adviser. Courses in other programs in the University may also be selected (for example, Political Science 47.581), but not in excess of one full course (or the equivalent).
- A thesis equivalent to two full-course credits
- An oral examination on the candidate's thesis and program.

Course Work Program

- Five full courses (or the equivalent) excluding Anthropology 54.595, consisting of
- Anthropology 54.541
- Anthropology 54.542

- Four additional course credits as described in the thesis program above, chosen in consultation with the student's graduate adviser
- A written and oral comprehensive examination in the candidate's area of specialization and program (Anthropology 54.595).

Academic Standing

A grade of B- or better must normally be obtained in each course counted toward the master's degree. With the recommendation of the department, a candidate may be allowed a grade of C (but not C-) in one full course or each of two half-courses.

Doctor of Philosophy in Sociology

The substantive focus of the Ph.D. program is the organization and development of modern societies, both in a comparative context and with particular reference to Canadian society.

Admission Requirements

The minimum requirement for admission into the Ph.D. program is a master's degree (or the equivalent) in sociology, normally with a minimum average of B+ in courses (including the thesis where applicable), and with no grade below B.

Applicants who have deficiencies in certain areas may be admitted into the Ph.D. program, but will normally be required to complete additional course work.

Program Requirements

The specific program requirements of the Department of Sociology and Anthropology are the following:

- 10 full courses (or the equivalent), including Sociology 53.600, and a thesis equivalent to a maximum of seven full courses or a minimum of five full courses
- Written and oral comprehensive examinations in three areas of specialization
- An oral examination on the subject of the thesis and fields related to the candidate's Ph.D. program.

Comprehensive Examinations

Each Ph.D. candidate is required to write a total of three comprehensive examinations. At least one (but not all) of the three examinations will be undertaken in a sub-area of comparative social organization: the sub-areas are comparative societies, comparative institutions, occupations and formal organizations, social stratification and mobility, and social anthropology.

The remaining comprehensive examinations must be undertaken in:

- social demography-ecology, and/or
- theory-methodology

An approved field in a related discipline may be substituted for one of the areas listed above.

The comprehensive examinations are normally undertaken after completion of at least one year of Ph.D. study, and must be successfully completed at least one term before the oral defence of the thesis.

Language Requirements

The Department of Sociology and Anthropology requires each Ph.D. candidate to demonstrate an understanding of a language other than English. Although French is the preferred second language, students may be permitted to substitute another language if it is demonstrably relevant to their professional interests. It is strongly advised, however, that all English-speaking candidates be proficient in French. The language requirements may be satisfied by a demonstration of reasonable understanding, on sight, of material contained in selected samples of the sociological literature in that language. Students may find it necessary or advisable to take a course in the required language before undertaking the departmental language examination.

Academic Standing

Candidates must obtain a grade of B- or better in each course and on the comprehensive examinations.

Graduate Courses*

• Sociology 53.500
Traditional Theory: Marx's Sociology
Marx's sociology and his theories of ideology, social class, social change (historical materialism), surplus value, and political sociology.
Credit will not be given for both Sociology 53.500 and Political Science 47.431.

• Sociology 53.501
Traditional Theory: Durkheim and Weber
Durkheim: the social division of labour and social evolution, the theoretical and methodological analysis of *Suicide*, the method of sociology, the science of morals, and the sociology of religion.
Weber: social action theory and interpretative sociology, the distinction between natural and cultural sciences, the theory of value, the construct of ideal type, the concept of rationality, and the rationalization of life through secularization and bureaucratization.

• Anthropology 54.504
Ecological Anthropology
This course examines anthropological approaches to the study of human-environment relationships. Topics covered include the influence in anthropology of biological evolutionary theory, and the applicability for humans of ecological models derived from studies of non-human species. Research on the ecology of foraging and horticultural societies will be reviewed, and we will consider how results from such studies of other cultures may provide insights in understanding ecological relations and problems in our own society. Finally, the implications of ecological analyses for the making of social policy will be considered.

• Sociology 53.507
Social Change and Economic Development
A critical examination of studies of change and development in historical and contemporary national and transnational systems.

• Anthropology 54.508
Structuralism
A theoretical and applied examination of the structuralist perspective as employed in anthropological analysis. The course explores both the general principles of structuralist theory, and its techniques of application to concrete examples drawn from different societies and aspects of social life, such as rituals, cosmology, legends, art, literature, films, commercial ads, food habits, and discourse in general. Emphasis is placed on the Levi-Straussian contribution to modern semiology, the understanding of symbolic activity, and its relationship to such other contemporary schools of social scientific thought as structural psychoanalysis and structural Marxism.

• Sociology 53.509
Philosophy of Social Science I
The seminar considers the philosophy of language and the basic elements of scientific method, such as the classification of the sciences, the concepts of value, cause and probability, induction and deduction, confirmation of hypotheses, and the concept of truth.

• Sociology 53.511
Research Design and Data Analysis
An integrated approach to the problems involved in the analysis of quantitative data; research design and procedure and statistical inference are studied. Participants will be required to attend lectures in Sociology 53.370, as well as a discussion group for graduate students only. In addition to the work normally required in Sociology 53.370, graduate students must submit a research paper on a topic related to their interests.

• Sociology 53.512
Statistical Methods I
A course on multiple regression analysis, with a review of basic statistical assumptions and techniques, followed by a detailed discussion of multiple regression analysis as a statistical technique. Particular attention will be paid to the practical problems associated with regression analysis of sociological data.

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

• Anthropology 54.516
North American Native Studies
An anthropological examination of selected issues concerning traditional and modern Indian, Inuit, and Métis societies, with emphasis on the Canadian scene. The course will explore controversies surrounding social change, "modernization", and cultural autonomy. Debates over resource management, native rights, government policy, and women's status may be examined.

• Sociology 53.525T2
Canadian Society
A critical examination of sociological models of modern societies and their relevance to Canada. Special attention is given to current research and its application to contemporary issues.

• Sociology 53.526F1
Sociology of Occupations and Professions
A consideration of the development and occupational recruitment patterns and manpower problems in developed and developing areas.
B.A. McFarlane.

• Sociology 53.530
Social Institutions I
Topic for 1983-84: Sociology of Culture
The seminar will treat selected topics within a cultural studies perspective. Examining several institutional areas, such as media, communications technology, education, and the polity, the seminar will explore how ideas and knowledge are produced, transformed into material force, and affect the course of the class struggle.

• Sociology 53.531F1
Social Institutions II
Topic for 1983-84: Labour Unions: Organizations/Movements
Viewing labour unions as both organizations and movements, the seminar will address the following: Under what circumstances do they come into being? What conditions shape their activities, strength, and survival? How do they function, and what type of life history do they experience? What part do they play in maintaining/changing the established order, both in the work context and in the society at large? Particular attention will be paid to similarities and differences among the several types of unionism (and other work-related organizations), as well as to cross-national comparisons.

• Sociology 53.532
The Labour Process
A consideration of the organization of work and production from feudal times to the present. The purpose of the course is to analyze the labour process in advanced capitalist societies by means of the historical comparative method.

• Sociology 53.533
Sociology of Education
The seminar generally concentrates on a specific topic within the larger field of the sociology of education. Among the topics considered will be the relations between education and other social institutions, the structure of educational opportunity, educational systems and organizations, and the sociology of learning.

• Anthropology 54.541
Anthropological Methods
An examination of the philosophy of social science and the basic elements of scientific methods, with particular emphasis upon the problems of anthropological field work.

• Anthropology 54.542
Explanatory Frameworks in Anthropology
An examination of theoretical and methodological problems in anthropological analysis. Alternative approaches to explanation and analysis in anthropology will be considered. These may include Marxism, functionalism, behaviourism, and structuralism, among others, at both the micro and macro levels.

• Sociology 53.545
Power and Stratification
An examination of theories of elite behaviour, social class, and ideology.

• Sociology 53.583
Departmental Seminar
Topic for 1983-84: Canada: The Thirties and the Eighties
A seminar in which the continuities and discontinuities between the thirties and the eighties will be treated in two ways. On the one hand, it will revisit the Depression, and its impact and aftermath, from the standpoint of the eighties and, more par-

ticularly, of the data, analyses, and explanatory frameworks that are currently available and in use. On the other, the seminar will pursue the question of whether or not it makes sociological sense to treat the thirties as a benchmark or source for the society of the eighties.

• Sociology 53.584
Modern Marxist Theory
An examination of topics of theory and research in modern Marxist literature; the central focus is on problems of class analysis, the state, and politics in advanced capitalist societies.

• Sociology 53.585
Selected Topics in Sociology
Topic for 1983-84: Comparative Class Structure
A research seminar devoted to the empirical analysis of class structure, class consciousness, and the labour process in a cross-national comparative context. Students will undertake the preparation and presentation of an original research essay based on one or more national surveys recently completed in seven countries, including Canada. This will be an advanced course for students already familiar with related theory and research.

• Sociology 53.586
Selected Topics in Sociology
Topic for 1983-84: Crime, Law, and Ideology
A review of the developments in criminological theory and in the broad area of the sociology of law that have emerged out of the critique of "labelling theory", most notably in Europe. A particular emphasis of the course will be on the convergence of "deviancy theory" and Marxism on the one hand, and feminism on the other. An examination of the "heritage" of classical Marxist and feminist theories of law will provide the groundwork for an evaluation of the work of contemporary European and North American students of crime, law, and "deviance".

• Anthropology 54.587
Selected Topics in Anthropology
Topic for 1983-84: Women: Family, Economy, and Society
This seminar course will examine aspects of women's status in various societies and at various times. The emphases will be on the theoretical understandings required to investigate women's status in society, and case studies of women in differing societies. Material will be drawn from anthropological and sociological studies of women, family, and economy in non-Western, Third World, and industrial societies.

• Sociology 53.589T1
The Logic of the Research Process
An examination of the research process, including the phases of conceptualization, choice of indicators, sampling, data collection, and analysis. Published articles will be studied as exemplars of the range of possible research strategies.
Stephen Richer and Hyman Burshtyn.

• Sociology 53.590F1, W1, S1
Tutorial

• Anthropology 54.590F1, W1, S1
Tutorial

• Sociology 53.595F1, W1, S1
Course-Work Comprehensive in Sociology
Available for students in a course-work M.A. who by the third term in their M.A. program have not yet completed their comprehensive and oral examinations. Completion of this course does not reduce the formal requirement of five full courses.

• Anthropology 54.595F1, W1, S1
Course-Work Comprehensive in Anthropology
Available for students in a course-work M.A. who by the third term in their M.A. program have not yet completed their comprehensive and oral examinations. Completion of this course does not reduce the formal requirement of five full courses.

• Anthropology 54.596
Field Seminar
This course is concerned with the conduct of directed field research, by special arrangement (for individuals or groups), to be combined with readings and papers under the supervision of a faculty member. The course may normally be taken only once in a student's program.

• Sociology 53.599F4, W4, S4
M.A. Thesis

• Anthropology 54.599F4, W4, S4
M.A. Thesis

• Sociology 53.600T2
Doctoral Seminar
This course, an examination and review of the major areas of theory and research of depart-

mental concern in the Ph.D. program, is required of all incoming Ph.D. students in their first year of residence. Other Ph.D. students still in residence are strongly urged to participate in this seminar. F.G. Vallee and D.R. Whyte.

- Sociology 53.601
Selected Topics in Sociology
Topic for 1983-84: Race, Ethnicity, and Class in Contemporary Societies
Various theoretical approaches concerning the persistence and re-emergence of ethnic and/or racial groups will be examined. Particular emphasis will be given to the intersection and overlap of ethnicity and race with social class.

- Sociology 53.690F1, W1, S1
Tutorial

- Sociology 53.699F, W, S
Ph.D. Thesis

Courses Not Offered in 1983-84

53.506 Economy and Society
53.513 Statistical Models II
53.514 Multivariate Analysis
53.515 Selected Topics in Social Research
53.517 Problems in North American Ethnohistory
53.520 Comparative Social Systems
53.521 Comparative Methods in Social Research
54.522 The Anthropology of Underdevelopment
53.533 Sociology of Education
53.534 Sociology of Law
53.535 Sociology of Religion
53.540 Political Sociology
53.560 Human Ecology
53.565 Demographic Analysis
53.566 Selected Topic in Sociology
53.575 Macro-Sociological, Demographic, and Ecological Problems
54.588 Selected Topics in Anthropology
53.602 Selected Topics in Sociology

Institute of Soviet and East European Studies

The Institute

Director of the Institute: J.L. Black

An interdepartmental committee was formed in 1963 to foster teaching, research, conferences, and publications in Soviet and East European studies at Carleton. In 1970, a separate department — the Institute of Soviet and East European Studies — was established to administer the interdisciplinary programs developed by the committee. Faculty members from eleven disciplines (art history, economics, German, geography, history, international affairs, law, political science, Russian, sociology, and social psychology) participate regularly in the institute's activities. They are joined on an occasional basis by visiting scholars from outside the University, including invited specialists from the USSR and Eastern Europe.

At the undergraduate level, the institute offers an interdisciplinary B.A. honours program in Soviet and East European Studies. The institute also administers a program of studies leading to a Master of Arts degree in Soviet and East European Studies, the only one of its kind in Canada. The curricula for both programs are offered largely through participating departments. The M.A. program is designed for students wishing to acquire specialized knowledge of the Soviet and East European area, including proficiency in the use of Russian as a research tool; the approach is interdisciplinary with emphasis on the social sciences and history. Students may take advantage of the University's regular academic exchanges with post-secondary institutions in Hungary, Poland, and the USSR.

Qualifying-Year Program

Applicants who have a general (pass) bachelor's degree in one of the disciplines represented in the program, or who lack sufficient area studies or language training, may be admitted to a qualifying-year program designed to raise their status to that of honours graduates in Soviet and East European studies. Students are expected to achieve high second-class standing in qualifying-year courses in order to qualify for admission to the master's year.

To be eligible for admission to the qualifying-year program, an applicant must already have taken some courses in the area of Soviet and East European studies, so that by the end of the program he or she will have satisfied the basic requirements for admission to the master's program. While language training can be offered as part of the qualifying-year program, students should have completed the equivalent of an introductory course in Russian upon entry.

Master of Arts

Admission Requirements

The normal requirement for admission to the master's program is an honours degree (or the equivalent) in Soviet and East European studies, with at least high second-class standing.

Honours graduates in other disciplines are eligible for admission provided they meet the following requirements:

- A knowledge of the Russian language sufficient for its use in research; in exceptional cases, the institute may permit the substitution of another Slavic or East European language.
- A total of seven full courses (or the equivalent) in the Soviet and East European field, taken in no fewer than three different departments
- At least high second-class standing.

Candidates with insufficient preparation in the Russian language or area studies may be admitted, but will be required to complete one or two additional courses. In some cases candidates may be required to enter the qualifying year.

Program Requirements

The specific requirements in the master's program are the following:

- Soviet Studies 55.500 and 55.501, two half-course seminars in Soviet and East European studies, offered specially by the institute, and incorporating the approaches of several relevant disciplines

• Two full courses, or the equivalent, chosen from the following list, with at least one full course (or the equivalent) at the 500 level. Students are advised to check with the relevant departments for final course listings for 1983-84, as changes in curricula may be made too late for inclusion below; some of the following courses are not offered every year. Undergraduate course offerings below the 400 level may be taken by qualifying-year students, and by students in the M.A. program as supplementary to the minimum M.A. course requirements. (See the institute's program description in the undergraduate calendar for a list of these course options.)

Art History
11.420 Early Christian and Byzantine Manuscript Illustration
11.421 Early Medieval and Byzantine Ivories
11.425 Byzantine and Russian Icon Painting

Economics
43.470 Comparative Economic Systems
43.536 Comparative Economic Systems I
43.537 Comparative Economic Systems II

Geography
45.571 Selected Studies in the Human Geography of Arctic and Subarctic Lands

German
22.401 Formal German Speech

History
24.460 Selected Problems in Russian History
24.461 Selected Problems in Soviet History
24.560 Late Imperial and Revolutionary Russia
24.580 Problems in International History
24.589 Historiography (section dealing with modern Russia)

International Affairs
45.520 Strategy and Security
45.521 Strategy and Security
46.535 The Political Economy of East-West Relations
45.566 Integration in Eastern Europe

Law
51.420 International Economic Law II
51.463 Public International Law
51.563 International Law

Political Science
47.431 Marxist Thought
47.432 Contemporary Communist Thought
47.461 Soviet Foreign Policy
47.514 Comparative Communist Politics: Theory and Practice
47.515 Comparative Communist Politics: Selected Aspects
47.516 Selected Problems in Soviet Politics

Russian
36.405 Tutorial: History of the Russian Language
36.435 Tutorial: Special Topic (Literature)
36.445 Tutorial: Special Topic (Drama)
36.455 Tutorial: Special Topic (Post-1917 Period)
36.493 Translation Tutorial
36.494 Translation Tutorial II

Sociology
53.545 Power and Stratification
53.500 Traditional Theory: Marx and the Marxists
53.550 National Unity in Multi-Ethnic Societies
53.583 Marx and Neo-Marxists

Soviet Studies
55.590 Tutorial in Soviet Studies
55.591 Tutorial in Soviet Studies
55.592 Tutorial in Soviet Studies
55.593 Tutorial in East European Studies
55.594 Tutorial in East European Studies
55.595 Tutorial in East European Studies

• One of the following:
Soviet Studies 55.598, a research essay incorporating the approaches of at least two of the disciplines represented in the program; the research essay must be combined with an additional full course (or the equivalent) chosen from those listed above
or
Soviet Studies 55.599, an M.A. thesis which must combine the interdisciplinary approach with a greater degree of originality than that required of the research essay, and which must be defended orally.

• An oral comprehensive examination to determine the candidate's general competence in the area, and his or her ability to relate at least two disciplines to the study of the USSR and Eastern Europe.

In cases where, on admission, a student's command of the Russian language has been deemed insufficient, he or she may be required to pass an examination in Russian to English translation.

Candidates are encouraged to incorporate study at an educational institution in Eastern Europe or the Soviet Union into their degree program. They are also encouraged to take a tutorial in one East European language (other than Russian) offered by the Department of Russian.

Academic Standing

Master's candidates must obtain a grade of B- on all work credited towards the degree.

Graduate Courses*

- Soviet Studies 55.500F1
Interdisciplinary Seminar on the Soviet Union and Eastern Europe
The themes of the seminar vary from year to year, but the continuing objective is to apply the approaches and methods of several relevant disciplines to selected issues and countries.

- Soviet Studies 55.501W1
Interdisciplinary Seminar on the Soviet Union and Eastern Europe
The themes of the seminar vary from year to year, but the continuing objective is to apply the approaches and methods of several relevant disciplines to selected issues and countries.

- Soviet Studies 55.590F1
Tutorial in Soviet Studies
A course of directed readings on selected aspects of the Soviet Union, involving preparation of papers as the basis for discussion with the tutor. Offered when no regular course offering meets a candidate's specific needs.

- Soviet Studies 55.591W1
Tutorial in Soviet Studies

- Soviet Studies 55.592S1
Tutorial in Soviet Studies

- Soviet Studies 55.593F1
Tutorial in East European Studies
A course of directed readings on selected aspects of Eastern Europe, involving preparation of papers as the basis for discussion with the tutor. Offered when no regular course offering meets a candidate's specific needs.

- Soviet Studies 55.594W1
Tutorial in East European Studies

- Soviet Studies 55.595S1
Tutorial in East European Studies

- Soviet Studies 55.598F2, W2, S2
Research Essay
A research essay on some topic relating to the Soviet Union or Eastern Europe.

- Soviet Studies 55.599F4, W4, S4
M.A. Thesis

Other Courses of Particular Interest

Department of Criminology, University of Ottawa
CRM 63213 Crime and Criminal Policy in Communist Countries

Department of Political Science, University of Ottawa
POL 7605 Séminaire de Recherche en Politique Internationale

*F,W,S indicates term of offering.
Courses offered in the fall *and* winter (or any other two terms) will be followed by T.

The number following the letter indicates the credit weight of the course: 1 denotes a half-course credit, 2 denotes a full-course credit, etc.

Chancellor

Gordon Robertson, B.A. Saskatchewan, B.A. (Juris.) Oxford, M.A. Toronto, LL.D. Saskatchewan, McGill, Toronto, Dalhousie, D. d'Univ. Laval, F.R.S.C.

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B.A. Bowen, B.Sc., M.Sc. Queen's, Ph.D. Syracuse

J.C. Bryant, B.Sc., M.Eng. Carleton

R.J.A. Buhr, B.Sc. Queen's, M.Sc. Saskatchewan, Ph.D. Cambridge

D.C. Coll, M.Eng. McGill, Ph.D. Carleton

John de Mercado*, M.Sc., Ph.D. Ottawa

David Falconer, B.A.Sc. Toronto, S.M., Ph.D. M.I.T.

Kamilo Feher*, Dipl. Eng. Zagreb, M.Sc.A. Montréal, Ph.D. Sherbrooke

D.A. George, B. Eng. McGill, M.S. Stanford, Sc.D. M.I.T.

M.A. Gullen, B.Sc. Edinburgh, M.S. Purdue

H.M. Hafez, B.Sc., M.Sc. Alexandria, Ph.D. Carleton

A.R. Kaye, B.Sc. London, M.Eng., Ph.D. Carleton

Carl Kropp*, B.Sc. Queen's, B.Sc., M.Sc. Carleton

W.R. LaLonde, B.A.Sc., M.A.Sc. Toronto, Ph.D. Waterloo

S.A. Mahmoud, B.Sc. Ain Shams, M. Eng., Ph.D. Carleton

L.R. Morris, B.A.Sc. Toronto, D.I.C. Imperial, Ph.D. London

A.I. Noor, B.Sc. Dacca, M.Sc. Alberta

Bernard Pagurek, M.A.Sc., Ph.D. Toronto

J.S. Riordon, M.Eng. McGill, D.I.C. Imperial, Ph.D. London

A.U.H. Sheikh, B.Sc. Lahore, M.Sc., Ph.D. Birmingham

C.D. Stothart*, B.Sc. New Brunswick

K.C. Toth, B.Eng., M.Eng., Ph.D. Carleton

C.M. Woodside, B.A.Sc. Toronto, Ph.D. Cambridge

Calendar of Milestones

The Institution

1941
The Ottawa Association for the Advancement of Learning was established to develop Carleton College. The next year the College offered only evening classes in introductory university subjects, with some courses in public administration.

1943
The incorporation of the Ottawa Association for the Advancement of Learning.

1945
Beginning of day classes and full-time teaching in arts, science, journalism, and first-year engineering. Establishment of the Faculty of Arts and the Faculty of Science.

1946
Move from rented premises to First Avenue campus, formerly Ottawa Ladies' College. First degrees awarded in journalism and public administration.

1947
The College committed itself to develop pass and four-year honours programs.

1949
First undergraduate pass degrees in arts, science, and commerce awarded. Formation of Senate.

1950
First honours degrees in arts and science awarded.

1952
The Carleton College Act, 1952 passed by the Ontario Legislature. This changed the corporate name to Carleton College and confirmed the power to grant degrees. Property for Rideau River campus acquired.

1953
Establishment of the School of Public Administration.

1954
Appointment of Architectural Associates for Carleton to prepare a master plan for Rideau River campus, and to design the first group of buildings. First honorary degree of LL.D. conferred on Dag Hammarskjold, Secretary-General of the United Nations.

1955
First Master of Arts degree awarded.

1957
The Carleton University Act, 1957. Establishment of the School of Engineering. Establishment of the Institute of Canadian Studies.

1958
First Master of Science degree awarded.

1959
Move to Rideau River campus, following construction of the Henry Marshall Tory Building (science), the Maxwell MacOdrum Library, and Norman Paterson Hall (arts).

1961
First Ph.D. degree in science awarded. First degrees in engineering awarded.

1962
Southam Hall, the University Commons, Renfrew House and Lanark House (residences) completed. Norman Paterson Hall extended, and University Union opened.

1963
First Master of Engineering degree awarded. Reorganization into the Faculties of Arts, Engineering, Science, and Graduate Studies.

1964
The C.J. Mackenzie Building (engineering) completed.

1965
The E.W.R. Steacie Building (chemistry), Grenville House and Russell House (residences), Maintenance Building, and Heating Plant completed.

1966
First Ph.D. degree in engineering awarded. The Physics Building completed (designated in 1972 as the Herzberg Laboratories). Establishment of the Schools of International Affairs and Commerce.

1967
Loeb Building (social sciences) completed. Integration of St. Patrick's College as a division of the Faculty of Arts. Integration of the School of Social Work.

1968
First Ph.D. degree in arts awarded. First Master of Social Work degree awarded. Establishment of the School of Architecture.

1969
Controlled Environmental Facility (biology), Administration Building, Glengarry House (residence), and University Commons (residence cafeteria) completed.

1970
University Centre and Parking Garage completed.

1971
Arts Tower completed.

1972
Architecture Building completed. School of Social Work accommodated on the Rideau River campus.

1973
St. Patrick's College moves to new facility on the Rideau River campus. First degrees in architecture awarded. New athletic complex containing 50-metre pool and fitness centre opened. School of Industrial Design established.

1974
Faculty of Graduate Studies expanded into Faculty of Graduate Studies and Research. School of International Affairs renamed the Norman Paterson School of International Affairs. Master of Journalism program approved for September 1974. Master of Arts programs in anthropology and in religion approved for September 1975. Program leading to Certificate in Teaching of English as a Second Language established.

1975
Lester B. Pearson Chair for International Affairs approved for January 1, 1975. Establishment of Gerhard Herzberg Lecture Series in Science. First students enrol in public policy and management program offered jointly with the University of Ottawa.

1976
First Dunton Alumni Award presented, January 1976. Creation of the Paterson Centre in March 1976. Division of the Faculty of Arts into two separate faculties: the Faculty of Arts and the Faculty of Social Sciences, effective July 1976. First Master of Journalism degrees awarded, November 1976.

1977
Opening of the Criminology and Corrections Program at St. Patrick's College, April 1977.

1978
School of Continuing Education established. Credit courses offered on cable television for first time. Institute of Biochemistry established.

1979
St. Patrick's College ceased to operate as an academic unit of the University. Academic programs of the college continue as University programs, except for the Unified Liberal Arts Program.

1980
Establishment of the School of Computer Science. Establishment of the Chair of Office Automation in the Faculty of Engineering.

1981
Establishment of the Ottawa-Carleton Institute for Graduate Studies and Research in Chemistry, a joint program with the University of Ottawa. Establishment of a joint Ph.D. program in economics with the University of Ottawa.

1982
Establishment of the Ottawa-Carleton Centre for Geoscience Studies, representing the combined research strengths of Carleton University and the University of Ottawa, with programs leading to M.Sc. and Ph.D. degrees in most areas of geology. Establishment of a joint master's program in computer science with the University of Ottawa.

Presidents

1942—1947
Henry Marshall Tory

1947—1955
Murdoch Maxwell MacOdrum

1955—1956
James Alexander Gibson (acting)

1956—1958
Claude Thomas Bissell

1958—1972
Arnold Davidson Dunton

1972—1978
Michael Kelway Oliver

January 1—May 15, 1979
James Downey (*pro tempore*)

May 15, 1979—
William Edwin Beckel

Chancellors

1952—1954
Harry Stevenson Southam

1954—1968
Chalmers Jack Mackenzie

1969—1972
Lester Bowles Pearson

1973—1979
Gerhard Herzberg

1980—
Gordon Robertson